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A TREATISE
ON
THE CULTURE
OF
THE CUCUMBER:

SHEWING
A NEW AND ADVANTAGEOUS METHOD OF
CULTIVATING THAT PLANT,
WITH
FULL DIRECTIONS FOR THE MANAGEMENT THEREOF,
AND THE DEGREE OF HEAT IT REQUIRES ON EVERY
DAY OF THE YEAR;
AND
A METEOROLOGICAL JOURNAL of the Weather and Temperature
of the Climate in Lat. $51^{\circ} 20'$ North, Long. $0^{\circ} 1'$
East of London.

TO WHICH ARE ADDED,
HINTS AND OBSERVATIONS
ON THE
IMPROVEMENT OF AGRICULTURE.



BY JAMES M'PHAIL,
GARDENER TO THE RIGHT HON. LORD HAWKESBURY.

LONDON :
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1794.

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ADVERTISEMENT.

THOSE gardeners of my acquaintance, to whom I have explained the principles of my new method of cultivating and managing the Cucumber Plant, approve of it; but they, in general, say, Of what use will your method be to us, seeing we cannot put it in practice without the knowledge and approbation of our masters; because the bed must be built of bricks? This is, undoubtedly, a just and weighty observation; but, considering the small expense* attending the building of a brick bed after my plan, and the many advantages arising therefrom, I cannot, for a moment, entertain a doubt that gentlemen will have the least objection to adopting the method: For I have always found, and I believe, most gentlemen are forward and liberal in encouraging gardening in all its branches, particularly those which furnish their

* To build a bed for a three-light frame will require only about 700 bricks, 160 tiles, and lime, and labour.

tables with a succession of choice, wholesome, useful, rare fruits and vegetables.

But granting that gentlemen will not allow their gardeners a brick bed, yet I am in hopes that the directions which I have given relative to stopping the plants, setting the fruit, mould, heat, water, air, &c. will prove useful to many, especially to young men, even in the management and culture of the cucumber on a dung bed: This will infallibly be the case, if that be true, in general, which is said by a respectable modern author, I mean Dr. Hunter; for in his edition of Evelyn's *Silva*, published in the year 1786, vol. ii. p. 143, he says, "The gardeners advise that the barren flowers of cucumber plants should be carefully plucked off, by reason they think these deprive the plant too much of its nourishment; but, without doubt, they are mistaken; for the reason why the fruit drops off is, for want of being impregnated, and not for want of nourishment, as is the vulgar opinion." And nearly the same observations are made by the Rev. Robert Pierson, and published in Hunter's *Georgical Essays*.

Both these learned gentlemen censure gardeners in general without giving sufficient directions themselves for performing what we gardeners call setting the fruit. This spirit of censo-

censoriousness may easily be accounted for, inasmuch as these eminent philosophizing literary gentlemen have the theory, but are without the practice*: They, therefore, attribute the frequent failure of gardeners' crops of cucumbers to their not knowing that the plants bear male and female flowers; but I am clearly of opinion (and I doubt not but in this I shall have a majority, at least, of practical gardeners on my side), that the frequent failure of crops of cucumbers arises not so much from ignorance in gardeners respecting the plants bearing male and female flowers, as from causes with which these philosophers are probably not so well acquainted.

For my own part, rather than be without a brick bed for the culture of early cucumbers, I would be at the expense myself: The loss would be only that of the lime and labour, for the bricks retain their goodness.

It is known that I offered to publish a method of destroying the insects, and of healing the diseases which are natural to, and frequently destructive of,

* An obstacle to the progress of arts and sciences has been the neglect of practice in theoretical men, and the ignorance or contempt of theory in mere practical men; and several, who have written on gardening, have taken more pains, and shown greater abilities in informing gentlemen what gardeners ought to do, than they have done in teaching gardeners how to do.

the pine-apple, melon, and cucumber plants. Some people may therefore be somewhat disappointed when they perceive that in this volume there is no receipt, remedy, or cure, given for that purpose.

Had I obtained subscriptions sufficient to have defrayed the expense, I meant to have published another volume, including my method of cultivating the melon and pine-apple; and to have divulged a singular way of extirpating the insects, and of healing the diseases of the said plants; but having come short in my subscription list, for the present I have confined myself to the culture of the cucumber only; But for the satisfaction of those who are troubled with diseases or insects in the progress of the management of their cucumber plants, I inform them, that if they chuse to adopt my method of culture, which is the most cheap, simple, safe, and easy of any, neither diseases * nor insects will molest them, provided however that the seeds

* Snails and slugs may sometimes be brought into the frames along with the mould. These may be expelled by the hand; but before the plants are set in the frames, boiling water may be poured plentifully on the mould, flues, and frames, which will effectually destroy all insects that may have got in while the lights were off, or have been brought in among the mould.

Mice in dung beds are often very troublesome; but my brick bed is so constructed that no mouse can enter.

which

which they sow, be free of infection ; for it is an incontestable fact that diseases are sometimes hereditary in vegetables as well as in animals. And further, if any are doubtful of their seeds not being free of infection, or are not of a good sort, if they chuse to send or write to me free of postage, I will send them, gratis, seeds of the cucumber of my own sowing, perfectly free of infection, and of as good a sort for forcing as any in the kingdom.

In England subscriptions are become exceedingly frequent, and their frequency has rendered them liable to some abuses which begin to give them discredit.

In the year 1776, Mr. John Kennedy, gardener to Sir Thomas Gascoign, published a book, wherein he acknowledges that the pine-apple plants under his management were for several years in a very unprosperous state, occasioned by their being infested with insects, and that he tried every remedy that had been before published, but found them all ineffectual; but that at last he found out a never-failing remedy; this remedy he in that book published, and which is generally known.

In the year 1779, Mr. William Speechly, gardener to the Duke of Portland, published a pamphlet, price one guinea, on the culture of

the pine-apple, containing 174 pages, 72 of which are taken up in describing the different species of insects which infest forcing-houses and frames, and in giving receipts and prescriptions for their destruction. This author imitates the former, in saying that he tried every method he had heard of, both public and private, but all to no purpose; but that after many experiments, he luckily happened to fall on a never-failing remedy; this remedy, he says he has given with exact precision.

These two authors acknowledge the publication of many remedies, but pronounce them all ineffectual, except those of their own invention, which each in his turn holds forth as being infallible. But in this they seem to have written rather uncandidly; because they have neither quoted those authors who invented and published remedies before they did, nor have made comparison betwixt those ever-failing, and their never-failing remedies.

Again, in the year 1791, Mr. William Forsyth, gardener to the King, at Kensington, published a pamphlet, setting forth a never-failing cure for the diseases, defects, and injuries, in all kinds of fruit and forest trees. This author says, "He submits to the experience of the Public, a remedy discovered by himself, which has been applied

applied with never-failing success to all kinds of fruit-trees ; and has not only prevented further decay, but actually restored vegetation, and increased fruitfulness even in such as were apparently barren and decayed." And, in a letter to the commissioners of the land revenue, he declares that " he is able to suggest a complete remedy for all the defects (meaning, as may be gathered from the Commissioners' letter, the " defects in growing trees of all ages which have sustained damage from any cause whatever"); " and that remedy he supposes to be known only to himself, as it is not a remedy drawn from books, or learned from men." These assertions may, for any thing I know, be true; but in perusing Evelyn's *Silva*, which was first published in the year 1678, in vol. ii. p. 149, I read the following paragraph, which has, at least, a great similitude to that wonderful remedy discovered and divulged by Mr. Forsyth :

" Cankers, of all others the most pernicious, corroding, eating to the heart, and difficult to cure (whether caused by strokes or galling, or by hot and burning land), are to be cut out to the quick, the scars implastered with tar mingled with oil, and over that a spreading of loam, or else with clay and dung."

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The treatise written by Mr. Kennedy, as also that by Mr. Speechly, were published by subscription; and the one written by Mr. Forsyth was, as I have been informed, intended for subscription; but government thinking the disclosure of the secret might tend to the benefit of the public, gave the author a reward for its discovery.

Notwithstanding all this, it is still acknowledged by those whose knowledge is not local, that on an average one half, at least, of the melon and cucumber plants raised in this kingdom yearly, are, by diseases and insects, brought into a sickly state *, and frequently entirely destroyed: And, perhaps, not one house of pine-apple plants in ten is, at this time, clear of diseases or insects: The same may be said in respect to the number of fruit and forest trees. This, to every intelligent observer, being evidently the case, there is still room for others to come forward, and offer methods to effect that which, in fact, is not yet effected.

Of all those who have published receipts or remedies for the destruction of insects on the pine-apple plant, none, to my knowledge, have

* When plants are in a sickly state they cannot produce good or healthy fruit.

ever even pretended to cleanse an infected hot-house, without moving, shifting, cutting off the roots of the plants, washing, removing the tan, fumigating the house with sulphur, &c.; and after all this trouble and expence, if there happen to be left alive in the house, or on the plants, but one pair of male and female insects (even admitting the doctrine of univocal generation only), these will speedily produce a numerous offspring.

These few quotations and observations prove to a demonstration, that in coming forward with a profession of being in possession of an efficacious remedy, which is not made public, I only follow stale precedents; and although many have not become subscribers to my intended work, yet the number which have, convinces me that the method is still wanted and sought for; and I believe nothing so much hinders it from receiving more encouragement, as a general belief of its proving as little efficacious as those nostrums which have already met with ample encouragement for the bringing them into public view.

Having with mature deliberation considered these matters, I resolve to persevere in offering to publish my method, and if it shall happen that I am enabled so to do, it will accompany
a Treatise

a Treatise on the Culture of the Melon and Pine-apple; and I mean to compare my scheme of destroying the insects and healing the diseases of the aforesaid plants with those methods which are already published; and in particular with those of the three authors whom I have quoted, and of whose writings I design taking a retrospective view, not for the purpose of depreciation, but for that of investigation, and that the Public may be able clearly to see whose method is the most preferable for healing the diseases, and for destroying the insects, which are accounted detrimental to vegetation.

Mr. Speechly, after giving his receipt for the destruction of those insects which infest the pine-apple plant, suggests that a better and more easy remedy than his own might be invented; and for this end, he recommends that boiling water be poured upon quicksilver or mercury, and that the pine-apple plants be constantly watered with this water, which he supposes would be so impregnated by means of the quicksilver, that the juices of the plants would thereby in course of time be so changed, that instead of continuing to be the natural and proper subsistence of the insects, they would become poisonous to them. These and such-like suggestions are the fanciful imaginations of the mere speculative

culative theorist, and to the theorist only would I recommend the putting such methods into practice; all gardeners, farmers, and cultivators, of whatever name, description, or denomination, I would caution against trying or putting into practice any theoretical experiments or methods whatever, which in any way tend to vitiate or spoil the active juices of plants; but, on the contrary, would recommend and advise them to endeavour to feed their plants at all times with wholesome nutritive food. For supposing water to be impregnated with quick-silver, mercury, or such-like, would the plants receive such water as food? and if they did, would their juices be by it so changed as to become poisonous to the insects? and if they were, would it not be dangerous for man to eat the fruit which derived its nourishment from the juices thus vitiated?

Insects are endowed with certain and determinate powers and inclinations, impressed on them by the almighty Creator; by which they seem arbitrarily, and without their own knowledge or consciousness, directed and impelled to the performance of those various operations which they execute with such unremitting industry and art. They have a natural disposition or sagacity, by virtue whereof they are enabled
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to provide for themselves, and know what is good for them, and are determined to propagate their species. This is instinct, and is put into action by the natural and primitive principle of self-love, or by a love of pleasure, and aversion to pain; producing a voluntary inclination to perform certain actions, which tend to their well-being and preservation. To the performance of these actions they are particularly prompted by their present sensations, by imagination supplying the place of memory, and other causes. The wonderful effects produced by these instinctive appetites are further to be attributed to the exquisite construction in their bodily conformation, particularly in the structure of the various organs with which they execute their operations, and to the superior perfection and acuteness of their external senses, by which they are quickly and distinctly informed of those qualities of objects which most materially concern them. By this instinct, each tribe of insects have a strong propensity to refuse individually, and with their whole united power, whatever in food or climate tends to shorten their lives, or slacken their natural progress.

Again, every insect has its proper plant, or tribe of plants, which it naturally requires for
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its nourishment, and on which it generally lays its eggs, and that on the most concealed parts of the plant; and the plant, and insect which attacks it, are always natives of the same climate, and therefore endure the same degrees of heat and cold.

In hopes to be enabled at some future opportunity to discuss and investigate these matters, I shall for the present forbear to make any more observations on the subject: But from the few which I have made, may be drawn the following conclusion, *viz.* That, when certain plants are infested and attacked by their natural tribe of insects, it is an exceedingly nice point and curious operation to exterminate them, without injuring the plants, or stopping them their natural growth.

SUNDAY, April 27, 1794, was perhaps the warmest day ever remembered at that time of the year in this part of the country ; for at noon the mercury in Fahrenheit's thermometer, in the shade, stood at 77 degrees, and the day throughout was proportionably warm.

PREFACE.

I AM not the first who has written on the culture of the Cucumber, nor am I the first who has pretended to cause that vegetable to produce fruit in every month of the year *; but I have not known, or heard, of any gardener except myself that has so much as pretended to make it appear that he could produce cucumbers in every month of the year from the same plants.

I do not say, nor think, that I am possessed of more dexterity, nor even of so much, in the management of the cucumber on a dung-bed, as some are; but I have invented a bed on which I am confident that I can produce cucumbers with more certainty, less expense †, and much

* Some have been at the pains and expense to have ripe fruit in every month of the year, which is rather a curiosity than any real advantage. Millar's Dict. abridged. See Cucumis.

† Besides the saving in the dung and labour, the frames last longer on a brick bed than on a dung bed; because on the bricks they stand dry and steady.

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less laborious work to myself than any other person can do on a bed made of dung. It may not, therefore, be improper to give an account of the means which led me to this invention, and which I shall do as briefly as I can.

Before I came to live in this place, I had no experience of beginning to grow cucumbers earlier than about Christmas ; but when I came to live in this neighbourhood, I was informed that several of the neighbouring gardeners began every year to sow their seeds precisely on the 20th day of October, and that they generally cut fruit in January or February following.

It was in the month of January 1785 that I came to live here, and I found nine lights of tolerably good cucumber plants, from which I cut fruit some time in the month of March ; but not long after that they became infected with the mildew *, which brought them gradually to an untimely end : And the same year I had little or no better success with those under hand and bell glasses. Thus the first year of my servitude in this place passed over with no small anxiety on my side ; because I failed in having that vegetable either good or in plenty, which was required in the family.

* I was informed that the cucumber and melon plants in this garden had for many years been subject to the mildew.

In the month of October 1785 I sowed the seeds of the cucumber, from which I raised very good plants; and as I was allowed plenty of dung, and had horses and carts at my command to bring it, and labourers enough to work and prepare it, I thought I might come to do as well as my neighbour; but before the month of March I found I was mistaken, and during the year 1786 I had but little or no better success than in the preceding: My anxiety, therefore, was in no degree lessened, but on several accounts rather increased*.

The cause of my failure I attributed to the mildew and canker; I therefore studied to find out what was the cause of those diseases, in order that I might endeavour to discover a remedy for their cure; and, in process of time I was fortunate enough not only to find out from what causes they proceeded, and a method of cure, but, what is still a better method, to prevent the plants from being infected. Yet, notwithstanding my having acquired the possession of these attainments, I was still at a loss

* None but those who sensibly experience it, know the anxiety of mind felt by a servant calumniated, and in danger of losing both his place and character; and to have the prospect of being deprived of the ordinary means of subsistence, either through malice, prejudice, or oppression, needs more than common strength of mind to bear with patience.

how to produce cucumbers so early as a near neighbour, or so early as they were required in the family; for although I could, with much labour and great attention, preserve the plants alive through the winter, yet when the spring came, they were so weak and feeble that they were not able to produce fruit early, or in any quantity.

I was advised to apply for help to my neighbour, who, I was informed, had some secret method of promoting vegetation in winter, and which, as is said, was first found out and practised about Southgate, and that no person was to be let into this secret without paying a certain sum of money. The paying a little money for such a clever thing I had no objection to; but I was rather loth to have it said that I should be taught by one who, it might be expected, I ought to be capable of teaching: This, however, was only a piece of pride, over which, on due consideration, I for once obtained a victory. Accordingly I made application to my neighbour and brother-gardener, who readily consented to disclose to me the secret on condition that I should pay him five guineas; and so a bargain was made with seeming good will on both sides.

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The principal thing which I was taught for my five guineas was to keep down the burning heat of the dung about the roots of the plants by pouring water into the bed. This I confess was what I had not been so well versed or instructed in before ; it therefore proved serviceable to me.

However, although I was well pleased with my instructor, because I thought he kept back no part of his knowledge from me, yet I was by no means satisfied with the secret, as it was termed ; for although it was what I was not well skilled in before, yet the laborious work, continual attention, and great expence, were, in no degree, curtailed or lessened, and success in keeping the plants in a growing state during the winter was still very precarious : And, indeed, no wonder ; for I believe it would be an overmatch for the ingenuity of the greatest of our modern artificers, philosophers, or naturalists, to find out methods, and give proper directions, for rendering and keeping the air in the frames of a dung-bed sweet, and to put and keep in motion that degree of vegetative power which is necessary for the growth of a cucumber plant during the winter months, when that grand luminary, the sun, which is one of the principal causes of vegetation, is by the Maker of all or-
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dered for a time to withdraw some part of his fructifying heat from the regions in which we live.

Having taken these matters into mature consideration, I reasoned with myself in the following manner :

That the cucumber plant must grow naturally, and without artificial heat, somewhere.

That it does not appear to me that there is any internal heat in the earth which effects the vegetation of a cucumber plant in its natural climate, but what is raised by the heat of the sun ; and that, therefore, if the air in the frames could, by any means, be kept up to a proper degree of heat, there would be no occasion for heat underneath the mould in which the plants grow.

That in the common method of cultivating the cucumber plant in the winter and early in the spring, the great difficulty arises from the want of heated sweet air, and that in trying to get the air in the frames properly warmed, the roots of the plants are often injured ; and as it is the roots which carry the nourishment to the plant, if the roots are destroyed or hurt, the plant, of course, must languish till it has made fresh roots again,

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These and such-like considerations induced me to make trial of several experiments, among which were the following :

Of rotten dung I made a ridge or bed two feet broad, thirty inches high, and as long as the frames which were intended to be set upon it. On each side of this ridge I made up a lining of good warm dung, raising it higher than the ridge of rotten dung on account of its sinking; after that the frames and lights were set upon it, and managed in all other respects as a common dung-bed.

Another experiment which I made trial of was upon an old well-settled dung cucumber bed, in which I made holes here and there to enable the heat of the linings to warm the air in the frames.

A third experiment which I tried was with green turfs, which I had cut handsomely, and with them I built up the sides of the bed cleverly, leaving and making vacuities for the circulation of the steam of the linings among the turfs and underneath the mould in the frames. These three methods answered pretty well, but they were only the prelude or leading to a better and more durable plan ; for I thought of having a bed built of bricks ; and, to be short, I schemed out a plan, and got it executed.

In the first brick bed which I had built, a flue was carried length-wise in the middle of each frame, and the hills of mould for the plants to grow in were made upon this flue; but I was obliged to alter it, because I found the heat, introduced through means thereof, too powerful for the roots of the plants,

Also in the first bed I had six leaden pipes fixed in the frames, one end in the coverings of the flues, and which communicated with the steam of the linings, and the other end going through the north side of the frames, projecting about a foot beyond them: These pipes were intended to draw the heat out of the flues occasionally. Also in each three-light frame in the coverings of the flues I had round holes made here and there, and wooden plugs or stoppers fitted for them exactly. These holes or apertures were to admit the steam of the linings when sweet to enter the frames among the plants; but these, as well as the pipes, I found by experience to be useless, and even in some respects rather hurtful: They are therefore justly exploded, which renders a description of their operations at this time altogether unnecessary.

In the first bed too the four-inch thick solid walls between each three-light bed were carried
up

up full of apertures exactly the same as the sides of the bed : But these did not answer ; because in windy weather there was no check to the steam of the flues, and therefore one end of the frames was at times rendered too cold, and the other too warm.

In treating of the culture of the cucumber, I have, in the first place, taken notice of those parts of the globe in which I apprehend it naturally grows, and in particular that part of the world in which that vegetable was cultivated, and held in estimation by the ancients ; and it appears from the latest accounts we have, that the inhabitants of that country (Egypt) still continue to cultivate it in abundance, and even make its fruit, while in season, a part of their daily subsistence.

Secondly, I have given directions in what situation the bed should stand, and how it ought to be sheltered and protected from the high winds and inclemency of the weather, and have pointed out what sort of soil I think is the best for the culture of the plant, as also the sort of soil I use myself, the materials it is made of, and the method of making it : I have shown that the heat of this climate is too little for the production of the cucumber, and have made some observations on the nature and degree of heat it requires.

Thirdly,

Thirdly, I have said something about the quantity and quality of water requisite for its nourishment, and have exhibited the ill consequences arising from giving too much or too little, and I have mentioned what degree of heat and temperature the water should be of when it is most proper for the nourishment and growth of the plants.

Fourthly, I have pointed out the necessity of supplying the plants at all times with fresh sweet air, and have shown the bad consequences resulting from their being supplied with contaminated or impure air ; and I have given directions how to prevent unhealthy air from getting into the frames among the plants, as well as how to prevent impure air from being generated in the frames.

Fifthly, I have mentioned the method I take in making and managing the linings, so that the air in the frames may be kept up to a proper degree of heat, and sufficiently supplied with vegetative moisture : I have set forth the necessity of covering up the frames at nights, and recommended that particular attention should be paid thereto, and have laid down my method of covering and of uncovering.

Sixthly, I have described my method of stopping the plants, and of keeping them regularly
thin

thin both in their shoots and in their leaves ; so that their nutritive juices may not be unnecessarily wasted in feeding superfluous branches and leaves.

Seventhly, I have taken notice that the cucumber plant bears male and female flowers ; it therefore differs from the greatest number of plants, whose flowers are hermaphrodite, that is, they contain within them the characters of both sexes *, or the male and female organs of generation

* The sexual system is suggested and confirmed by the analogy observable between the eggs of animals and seeds of plants, both serving equally to the same end, that is, that of propagating a similar race ; and, by the remarks which have been made, that when the seed of the female plant is not impregnated with the prolific powder of the male, it bears no fruit, inasmuch that as often as the communication between the sexual parts of plants has been intercepted, which is the cause of their fecundity, they have always proved barren. The authors of this system, after exactly anatomizing all the parts of the plant, assign to each a name, founded on its use and analogy to the parts of an animal. Thus as to the male organs, the filaments are the spermatic vessels, the anthera the testicles, and the dust of the anthera corresponds to the sperm and seminal animalcules ; and as to the female, the stigma is the internal part of the female organ which receives the dust, the style answers to the vagina, the germ to the ovary, and the pericarpium, or fecundated ovary, to the womb.

The sexual system was not wholly unknown to the ancients, though their knowledge of it was very imperfect. Accordingly we find in the account by Herodotus of the country about Babylon where palm-trees abounded, that it was a custom with the natives in their culture of these plants to assist the operations of nature by gathering

ration are in the same flower. The flowers of the cucumber plant being not of the hermaphrodite

gathering the flowers of the male trees, and carrying them to the female. By this means they secured the ripening of the fruit, which might else, on account of unfavourable seasons, or the want of proper intermixture of the trees of each sex, have been precarious, or, at least, not to have been expected in equal quantities.

The ancients had also similar notions concerning the fig. Theophrastus observes, that the characteristic and universal difference among trees is that of their gender, whether male or female. Aristotle says, that we ought not to fancy that the intermingling of sexes in plants is the same as among animals; however, there seems to have been a difference of opinion among the ancients as to the manner in which plants should be allowed to have a difference of sex. Some apprehended that the two sexes existed separately, and others thought that they were united. Empedocles says that plants were androgynous or hermaphroditical, or that they were a composition of both sexes. Aristotle expresses his doubt upon this head. Empedocles called plants oviparous; for the seed, or egg, according to his account, is the fruit of the generative faculty, one part of which serves to form the plant, and the other to nourish the germ and root; and in animals of different sexes we see that nature, when they would procreate, impels them to unite, and, like plants, to become one, that, from this combination of two, there may spring up another animal.

As to the manner in which fruits were impregnated, the ancients were not ignorant that it was by means of the prolific dust contained in the flowers of the male; and they remarked that the fruits of trees never came to maturity till they had been cherished with that dust. Upon this subject Aristotle says, that if one shakes the dust of a branch of a male palm-tree over the female, the fruit will ripen quickly, and when the wind sheds this dust of the male upon the female, it ripens apace, just as if a branch of the male had been suspended over the female. And Theophrastus observes, that they bring the male

dite kind, it is necessary, for the rendering it prolific, that the male flowers, or some quality belong-

male to the female palm, in order to make her produce fruit. The manner in which they proceed, says he, is this: When the male is in flower, they select a branch abounding with that downy dust which resides in the flower, and shake this over the fruit of the female; this operation prevents the fruit from becoming abortive, and brings it soon to perfect maturity. Pliny also informs us that naturalists admit the distinction of sex not only in trees, but in herbs and in all plants, yet this is no-where more observable, he adds, than in palms, the females of which never propagate but when they are fecundated by the dust of the male. He calls the female palms, deprived of male assistance, barren widows; he compares the conjunction of these plants to that of animals, and says, that to generate fruit the female needs only the asperision of the dust or down of the flower of the male.

Zaluzianscki seems to have been the first among the moderns who clearly distinguished from one another the male, the female, and the hermaphrodite, plants. About one hundred years after him Sir Thomas Millington and Dr. Grew communicated to the Royal Society their observations on the impregnating dust of the stamina.

Camerarius, towards the end of the last century, observed, upon plucking off the stamina of some male plants, the buds that ought to have produced came not to maturity. Malpighi, Geoffry, and Vaillant, have all carefully considered the fecundating dust, the latter of whom seems to have been the first eye-witness of this secret of nature, the admirable operation that passes in the flowers of plants between the organs of different sexes. Many authors afterward applied themselves to improve this system, the principal of whom were Morland, Logan, Van Royen, Bradley, Gotliel, Ludwigius, Blair, Wolfius, Verdreës, and Monro; but Linneus had the honour of completing this system by reducing all trees and plants to particular classes, distinguished by the number of their stamina or male organs.

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The

belonging to them, should co-operate with the female flowers; therefore I have pointed out the most judicious method of performing that operation.

Eighthly, I have mentioned what way the flues and brick-work of the bed are to be secured, so that the steam of the linings may not pe-

The sexual hypothesis, on its first appearance, was received with all that caution which becomes an enlightened age, and nature was traced experimentally through all her variations before it was universally assented to. Tournefort refused to give it a place in his system, and Postedera, though he had carefully examined it, treated it as chimerical. The learned Dr. Alston, professor of botany in the university of Edinburgh, violently opposed it; but the proofs which Linneus has given amongst the aphorisms of his *Fundamenta Botanica*, and further illustrated in his *Philosophia Botanica*, are so clear, that the mind does not hesitate a moment in pronouncing animal and vegetable conception to be the same, but with this difference, that in animals fruition is voluntary, but in vegetables necessary and mechanical. The impregnation of the female palm by the farina of the male, related by M. Mylius, in his letter to Dr. Watson, establishes the fact attested by the ancients concerning the palm-tree; and as to the fructification in other vegetables (though it may differ in particular circumstances, it has nevertheless a conformity to that of the palm-tree with respect to the parts supposed to be the organs of generation, which are discoverable either on the same or in a separate flower), we may, from this single experiment, deduce an argument by analogy for the confirmation of the whole sexual hypothesis.

Besides, a very striking proof of the analogy between plants and animals may be drawn from observations made in their infant states, at which early period they seem nourished and protected in a similar manner.

netrate

netrate through them into the frames; and I have given directions in what manner the pits are to be filled up first with stones, broken bricks, or chalk, to drain the wet from the mould, and then with mould for the plants to grow in.

Ninthly, I have given a short account of the method generally practised in the cultivation of early cucumbers on a dung-bed, and have taken notice of some of the difficulties and inconveniences accompanying that mode of management, and which now may be exploded; because a better method is found out, and put in practice, and which is on a brick-bed simple in its construction, free and easy in its management: The preferableness of this new method over that of the old I have endeavoured to demonstrate.

Tenthly, I have given the method which I follow, and which I believe is generally practised in the cultivation of cucumbers in summer in the open air trained from under hand or bell glasses.

Lastly, I have made a few observations on the management held forth in the annexed journal, I have pointed out the errors which I fell into during the course of one year's management, and have concluded with mentioning the medium degree of heat which I wish to keep in the cucumber frames during the winter and spring months.

Upon

Upon the whole, I am in hopes that this effort of mine to render the cultivation of early cucumbers more intelligible, more easy, and more certain, will not prove ineffectual, but be acceptable and useful to many whose business it is actually to perform the practical part ; and I am also not without some hopes of its being acceptable, at least in some degree, even to those whose business is not actually to cultivate, but who admire and encourage the bringing to perfection such fruits and vegetables as are generally thought worthy of being brought forward by means of artificial heat and moisture, and which, on account of the expense attending the mode of their cultivation, and the skill and attention required in their management, have, are, and ever will be, accounted rarities.

ADDISCOMBE PLACE,

May 1, 1794.

1794

INTRODUCTION.

FOR the sake of perspicuity, and that no person may be at a loss to know my mode of management, I have subjoined a diary or journal, which contains an accurate account of the degrees of heat which I kept in the cucumber frames, during one year; and of every thing done, or thought necessary to be done, in the cultivation of the cucumber.

I have kept a journal for some years; and in the medium heat which I kept in the frames during that time, there is but little difference. I do not take upon myself to assert, that my mode of management with regard to heat, water, earth, and air, is the best that can be; but this I can with truth say, that with the degree of heat I keep, and the other co-operating elements, the plants continue throughout the season to produce plentiful crops of good, well-flavoured fruit.

If any person shall think that the degree of heat which I keep is too great, it is an easy matter for him to keep less; and if any person at any time want more heat, it is easily increased, either by larger coverings, less air, or more heat in the linings.

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My

My method of keeping the same plants in bearing for such a length of time, is not a matter of mere curiosity, but of real advantage, to those who wish to be constantly supplied with that vegetable. However, were the plants to be destroyed in the months of July or August, and young plants in readiness beforehand to substitute in their place; such a mode of management, for any thing I know, might be more productive, than that of continuing on the same plants: But this I only give as theory. Unless it be for curiosity, I do not think that it is worth any gentleman's while, to try to have cucumbers for more than eight or nine months in the year; nor is it perhaps one year in three, that they will succeed, in the months of November, December, January, and to the middle of February.

I have frequently sown the seeds of cucumbers in the month of August, and have planted them in boxes of mould, placed on the back flues of the hot-house, not far from the glass, and have sometimes cut fruit from them till about Christmas.

In warm parts of the country, the glasses and frames may be taken off the plants of the brick bed, towards the latter end of June; and, if the summer prove fine, the plants will bear for at least two months: But to make sure of a constant supply of good clear fruit, I think it best to keep on the glasses all the summer.

Some gardeners take great pains in shading their plants, on days of hot sunshine; this method I by no means condemn, but I seldom practise it.

When

When I cultivated the cucumber on beds made of dung, early in the spring I was frequently obliged to shade the plants from the rays of the sun, to prevent their leaves from flagging; but shading the plants so early, is a great hindrance to them.

When the cucumber plant cannot stand the sun, but droops its leaves when his rays dart themselves upon it, the plant is not in a good state of health; or else air has been let in to the frames too suddenly, or in too great a quantity, or it wants water: If a cucumber plant be in a good state of health, the rays of the sun may scorch its leaves, but they will not cause the plant to flag; for the greater heat his rays dart upon it, the more upright will its leaves stand; for much heat makes the juices flow rapidly, and thereby the vessels of the plant, being filled with the vegetative juices, are distended, and the erection of the leaves of the plant greatly promoted.

It is not absolutely necessary to use thermometers in the cucumber frames: I myself, and many others, can manage the bed and frames very well without them, especially without one plunged in the mould. It may then be said, why do I use them? I answer, first for my own pleasure and satisfaction; and secondly, in order that I might the better give to every one who chuses to read, an opportunity of being able to approve or disapprove of my mode of management: And whether, in general opinion, the scale turn to approbation or disapprobation, yet the same cause will always produce the same effect; and, therefore, if any person chuses to keep the heat of

his frames to nearly the same degree as I do, together with a sufficiency of air and moisture, he may rely upon being successful.

I do not mean, that the heat should be kept to the very same degree, on every identical day of every year; for that would be impossible, unless every day in every year were to be of the same degree of heat: But as that is not in natural vegetation, neither can it be in artificial vegetation; for forcing vegetation is only assisting the climate, where the climate falls short in its productions.

The following register for one day, of the temperature of the open air, and of that of the cucumber frame, may serve to illustrate the foregoing paragraph.

Tuesday, February 21st, 1792.

Hours.	S.	Th.	P.	Th.	Ther.	Wind.
7	—	—		7		S. W. Clear, and a brisk air of
8	72	78		10		S. W. Ditto. [wind.
9	71	78		13		S. W. Bright sunshine.
10	72	78		18		S. W. Ditto.
11	78	78		21		W. Ditto.
12	80	78		23		W. Ditto.
2	85	79		25		W. Ditto.
4	80	80		23		W. Ditto.
8	—	—		16		W. Clear, and nearly calm.
10	—	—		17		W. Ditto.

If the register of this day be compared with that of the same day of the same month of the succeeding year, 1793, a difference in the degrees of heat will be seen; and so it will happen, in a less or greater degree,

degree, in every succeeding year, month, or day. But it may be observed, that the disproportion is in general greater in the open air, than in that of the cucumber frames, especially in the winter and spring months.

In my journal I have given the degrees of heat, according to the thermometer, in the open air in the shade, at different hours of each day, for twelve months. The thermometer hung on a nail, which was driven into a brick wall, having a north aspect, and the south side of it covered from the direct rays of the sun by a thicket of shrubs. The ground at this place lies on a declivity to the north, about one mile northward of Addington hills, which are barren of every vegetable, except heath of different sorts. Snow lies here for a short time after it is melted in the adjacent country; and the garden crops are later, by eight or ten days, than they are in some parts, only about four or five miles distant: This, I apprehend, is occasioned by the nature of the soil, which is various, even in the same field; some being a sandy loam, some a cold clay, and some gravelly, and underneath in some parts is strong clay, in other parts sand and gravel, and some parts are springy. In this part of the country, it is but seldom that the thermometer falls below 20, or rises above 80: It would, therefore, seem that the medium heat is about 50.

I have often tried the heat of the springs in this part of the country, and I never found them make the mercury in the thermometer fall below 44, nor

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raise

raise it above 56. The medium heat of the water of the springs, therefore, seems to be the same as the medium heat of the open air: But the water of the springs is much less liable to change than the air is, inasmuch as the cause of the changes in both, cannot operate with the same freedom on the one, as it does on the other.

The greatest degree of cold I ever observed, was on Tuesday, the 21st of February 1792: At seven o'clock in the morning of that day, the mercury stood at 7, and it rose no higher that day than 25, although the sun shone bright all day. And the hottest day I ever took notice of, was Sunday the 7th of July 1793, a register of which is to be seen in my journal.

It appears, from a register of the thermometer kept at London by Dr. Heberden, for nine years (that is, from the end of 1763 to the end of 1772), that the mean heat, at eight in the morning, was 47; and by another register, kept at Hawkhill, near Edinburgh, that the mean heat in that place, during the same period of time, was 46. By registers kept in London, and at Hawkhill, for the years 1772, 1773, 1774, it appears that the mean heat of these three years in London, at eight in the morning, was 48; and at two in the afternoon, 56: And the mean heat of three years, both morning and afternoon, 52. And the mean heat at Hawkhill, for the same time, at eight o'clock in the morning, was 45; and at two in the afternoon, 50: And the mean heat for the morning and afternoon, for the whole time, 47. The mean heat

heat of springs near Edinburgh, seems to be 47; and London, 51. Phil. Trans. vol. lxxv. From the Meteorological Journals of the Royal Society, published in the Philosophical Transactions, it appears that the mean heights of the thermometer, kept without and within the house, are as below :

	Ther. without	Ther. within
For 1775	- 51 5	- 52 7
1776	- 51 1	- 52 9
1777	- 51 0	- 53 0
1778	- 52 0	- 53 1

And, therefore, according to these observations, the mean heat of four years, estimated by the external thermometer, is 51. The least height, during this period, was on the 31st of January 1776, at eight o'clock in the morning, when it was 13: And the greatest height, which was on the 13th and 14th of July 1778, at two in the afternoon, was 86.

It is well known that heat, in all bodies, has a tendency to diffuse itself equally through every part of them, till they become of the same temperature: Again, bodies of a large mass are both cooled and heated slowly. Besides the mass of matter, there are two other considerations of much importance, in the slow or quick transmission of heat through bodies: These are, their different conducting powers, and their being in a state of solidity or fluidity. The conducting powers of heat are well known to be very various in different bodies; nor are they hitherto reducible to any law, depending either upon the density or chemical properties of matter.

Metals of all kinds are good conductors of heat ; while glass, in a heavy, solid, homogeneous body, is an extremely bad conductor, even when a metallic calx enters largely into its composition, as in flint glass.

A state of fluidity greatly promotes the diffusion of heat ; for a body in a fluid state, by the particles readily moving among each other, from their different densities or other causes, mixes the cold and warm parts together, which occasions a quick communication of the heat. To apply these observations to the present subject : The surface of the earth being exposed to the great heats of summer, and the colds of winter ; or, more properly, the low degree of heat in winter ; will receive a larger proportion of heat in the former season, and a smaller in the latter : And being, further, of a large mass, and of a porous and spongy substance ; and, therefore, not quickly sensible to small variations of heat ; it will become of a mean temperature at a certain depth between the heat of summer and cold of winter, provided it contain no internal source of heat within itself.

Water, though in a large mass, follows in some degree the heat and cold of our summer and winter, from the fluidity of its parts occasioning a more speedy effusion of heat.

Air is quickly susceptible of heat ; and from the expansions produced in it, and consequent motions in the whole mass, the temperature is rendered soon uniform. The changes in the heat of the air are what we have measured ; and we are to be understood

stood to speak of them, when we talk of the temperature of summer and winter. It may be asked then, Is the heat of the sun first communicated to the air, and thereby to the earth? No: The air is susceptible of a very small degree of heat, from the rays of the sun passing through it; for it is well known they produce no heat in a transparent medium, and consequently, that the air is only so far heated as it differs from a medium that is perfectly transparent.

The heat produced by the rays of the sun, bear a proportion to their number, their duration, and their falling more or less perpendicularly; and it takes place at the points where they strike an opaque and non-reflecting surface.

The surface of the earth may, therefore, be considered as the place from whence the heat proceeds, which is communicated to the air above, and the earth below. That this is really the case, is evident, from the superior degree of heat produced by the action of the sun upon an opaque body, which will often be heated to 150 (Fahrenheit), while the temperature of the air is not above 90. It may seem, therefore, that, to measure the heat communicated to the earth, it should be done at the surface, where the action of the rays immediately takes place.

But though the heat be produced at the surface, it is communicated freely to the air as well as to the earth, from the rays of light acting for a longer time upon the same parts of matter: Yet there is little doubt that much the greater part is carried off, which as it is heated flies off, and allows a fresh portion

portion of cold air to come in contact with the heated surface.

But still it is immaterial, whether the heat of the sun be excited more in the earth, than in the air; for whichever has the largest portion, will in the end communicate a part to the other, and so restore the balance. The same observation applies to such causes of cold as may operate at the surface of the earth; as evaporation, and that taken notice of by Mr. Wilson. The air, therefore, near the surface of the earth, will show by a thermometer in the shade; nearly, if not exactly, the same degrees of heat that the sun communicates to our terrestrial globe: And if a mean of the heats thus shown, be taken for the year round, and we penetrate into the earth to that depth that is no longer affected either by the daily, monthly, or annual variation of the heat; the temperature at such a depth should be equal to the annual mean above mentioned.

To ascertain this with the utmost precision, it must be obvious that numerous observations should be made every day, corresponding to the frequent changes of temperature, which are known to happen in the twenty-four hours in all climates; and upon these a daily mean should be taken, and the annual mean deduced therefrom. This has not yet been done: But when we have observations, from which a mean temperature can be deduced with any degree of certainty, it will be found not to differ greatly from the heat of deep caves or wells in the same climate.

If

If further experience and observation should confirm the above opinions, it will be attended with this advantage, that we shall be possessed of a ready method of ascertaining the mean temperature of any climate; which, with a few observations of the extremes of heat and cold at particular seasons, will teach us as much of the country, with regard to heat and cold, as the meteorological observations of several years.

For obtaining the temperature of the earth, the best observations are probably to be collected from wells of considerable depth, and in which there is not much water. Springs issuing from the earth, although indicating the temperature of the ground from whence they proceed, are not so much to be depended upon as wells; for the course of the spring may be derived from high ground in the neighbourhood, and it will thence be colder: And it may run so near the surface, as to be liable to variations of heat and cold, from summer and winter; or it may be exposed to local causes of heat in the bowels of the earth.

Wells seem also better than deep caverns; for the apertures to such are often large, and may admit enough of the external air to occasion some change in their temperature. Wells are, however, not to be met with in all places; and in that case, we must remain satisfied with the springs.

The following observations were made in the island of Jamaica, where there are flat lands in many parts towards the coast, but all the interior part of the country

country is mountainous: The heat is greatest in the low lands, and decreases as you ascend the mountains. The town of Kingston * is supplied with water from wells; the ground on which it stands rises with a gentle ascent, as you recede from the sea. In the low parts of the town, the wells are but a few feet deep, and many of them brackish: The heat of the water in some of them is found to be as high as 82; but they are evidently so near the surface, as to be affected by the heat of the seasons. As you ascend, the wells are deeper; and the temperature is nearly 80 in all of them: What variations there are, come within one degree; that is, half a degree less than 80, or half a degree more. They are of different depths, and some not less than 100 feet; though if they are of half that depth, the temperature is nearly uniform.

Near Rock Fort is a spring, immediately at the foot of the long mountain; of which, though not a great body of water, the heat is 79. All the places mentioned, are but little above the level of the sea; probably not more than the depth of the wells, at the respective places.

The temperature of the air at Kingston admits but of small variations: The thermometer, at the hottest time of the day, and during the hottest season of the year, ranges from 85 to 90. In the severest season, and observed about sun-rising, which is the coldest time in the twenty-four hours, it ranges from 70 to 77: It has been seen as low as 69,

* Kingston lies in latitude 17° 50' north, and in longitude 76° 32' west.

and sometimes as high as 91. The annual mean temperature cannot, therefore, either much exceed or fall much short of 80, as indicated by the wells.

Philos. Transf.

That heat and cold very much depend on the clearness or darkness of the sky, is attested by fact; for the winter cold in South America is very sharp, because the atmosphere is loaded with clouds and icy particles, which intercept the rays of the sun. At Lima, in latitude 12° south, where the sky is never free from vapours, the heat is moderate; but at the distance of a few miles, the sky is more serene, and there the heat is greater: And at Carthagena, in latitude 11° north, the heat on this account is intolerable.

The different degrees of heat and cold in different places, depend, in a very great measure, upon the accidents of situation, with regard to mountains or valleys, rivers, seas, and wood, and the nature of the soil. Mountains, especially when they are lofty and covered with snow, greatly help to chill the air, by the winds which come over them, and which blow in eddies through the levels beyond.

Mountains sometimes turning a concave side towards the sun, have the effect of a burning mirror, on the subject plain; and the like effect may sometimes be had from the concave or convex parts of clouds, either by refraction or reflection: And some even take these to be sufficient to kindle the exhalations lodged in the air, and produce thunder and lightning.

As

As to soils: A stoney, chalky, or sandy earth, it is known, reflects most of the rays into the air again, and retains but few, by which means a considerable accession of heat is derived to the air; as, on the contrary, black, loose, and swampy soils, absorb most of his rays, and return few into the air.

It is certain, that heat, communicated by the sun to bodies on this earth, depends much upon other circumstances, besides the direct force of his rays; these must be modified by our atmosphere, and variously reflected and combined by the action of the surface of the earth itself, to produce any remarkable effects of heat: So that, if it were not for these additional circumstances, it is much to be questioned, whether the naked heat of the sun would be very sensible.

To this purpose it is observed by Ulloa, in his Voyage to Peru, that on the western shore of that country, from Santa Maria de la Purilla to Lima, it is winter on the mountains from January or February to June, whilst it is summer in the vallies; but from June to November or December, it is winter in the vallies, and summer in the mountains.

It is found, by the science of astronomy, that the sun is farther from the earth in summer, than in winter; but as the eccentricity of the earth's orbit bears no greater proportion to the earth's mean distance from the sun, than 17 do to 1000, this small difference of distance cannot occasion any great difference of heat or cold. But the principal cause of the difference between the heat of summer and
that

that of winter is, that in summer the rays of the sun fall more perpendicularly, and pass through a less dense or less thick part of the atmosphere; and, therefore, fall with greater force and in greater number on the same place: And besides, by their long continuance, a much greater degree of heat is imparted by day, than flies off by night.

“ A regiment, which had been abroad at Carthage and Jamaica, was afterwards ordered into the Highlands of Scotland; and on one day in particular, as they were on their march in the Highlands, it was agreed by the officers and all the men, that they had never felt the heat so intolerable in the West Indies *.”

Sudden changes from heat to cold, and from cold to heat, make either feel greater than they really are: In summer, if you put your hand into a good spring or well, you cannot with ease hold it long, on account of cold; and in the winter, the same spring feels warm, although the water of it be of the same degree of heat as it was in summer. Again, if in summer you go into a cellar under ground, the air feels cold; but if you go into it in the winter, the air feels warm, although its heat be nearly the same at both times: And in winter, when the open air is about freezing, if you go into a hot-house of about 65 or 70 degrees of heat, it feels very warm. Hence we may infer, that perhaps though the regiment thought the heat of the Highlands in Scotland more intolerable than that of Carthage; yet, in fact, the heat of the High-

* Jones's Physiological Disquisitions, p. 167.

lands.

lands might not be so great as that of Carthage. To my certain knowledge, the weather in some parts of the Highlands of Scotland is very cold: The nights are frequently frosty in the middle of summer. When I was a boy, I remember the ground to have been covered with a deep snow for thirteen weeks; I think it was about the year 1769. In the year 1791, at Croydon, which is ten miles south of London, in the month of June there were several frosty nights.

In Pennsylvania, in latitude 40° , the cold brought the mercury to 5, in 1732: At Paris, in 1709 and 1710, the mercury sunk to 8: At Leyden, in 1729, to 5: And at Utrecht, to 4. At London, in 1709 and 1710, the cold sunk the spirits almost down to the artificial cold of an ice and salt mixture: And in 1709, the mercury sunk to 0 at Copenhagen, lat. $55^{\circ} 43'$. At Upsal, in 1732, the mercury was at one degree below 0: And at Petersburg, lat. $59^{\circ} 56'$, the cold was severe enough to sink the mercury to 28 below 0. But in more northern latitudes, the cold is much more extreme. Maupertuis, who wintered at the north polar circle in 1736-7, found the degree of cold at Torneo *, lat. $65^{\circ} 51'$, sufficient to have made the mercury sink to 33 below 0: And yet this degree of cold is inconsiderable, compared with that which may be produced by art. In our climate, the heat of the air is most agreeable from 50 to 65. In captain Cook's voyage round the world,

* Torneo is a town in Sweden; and it is said, the cold is so severe there, that sometimes people lose their fingers and toes.

in latitude $14^{\circ} 32'$ south, the thermometer was raised to 85, which was the highest degree it got to during his voyage round the world ; when he was crossing the line it was about 80 and 82.

In Dixon's voyage the thermometer was never above 91, and when in latitude $0^{\circ} 8'$ south, which is nearly under the equator, it was at 85 : This was on February 27th, 1788.

“ The heat in Bengal in the summer months is variable in the shade from 98 to 120 degrees, and in the sun it probably does not fall short of 140 degrees *.”

The following extract is taken from Marfden's History of Sumatra :

“ Sumatra is an island in the East Indies ; the equator divides it in almost equal parts, the one extremity being in $5^{\circ} 33'$ north, and the other in $5^{\circ} 56'$ south latitude. It is found to lie 102° east of Greenwich. No country in the world is, perhaps, better watered than this : Springs are found wherever they are sought for ; the rivers on the western coast are innumerable. The heat of the air is by no means so intense as might be expected in a country occupying the middle of the torrid zone ; it is more temperate than in many regions without the tropics ; the thermometer, at the most sultry hour, which is about two in the afternoon, generally fluctuating between 82 and 85 degrees. I do not recollect to have ever seen it higher than 86 in the shade : At sun-rise it is

* Dr. Watson's Essays.

usually as high as 78." I do not find that Mr. Marfden has mentioned the degree of heat of the springs in Sumatra.

Dr. Mosely, in his book on Tropical Diseases, says, "In countries between the tropics the heat is nearly uniform, and seldom has been known to vary through the year on any given spot, either by day or night, more than 16 degrees. It is at a medium on the coast, and on the plains not much elevated above the level of the sea, at about 80 degrees of Fahrenheit's, or at 21 degrees of Reaumer's thermometer."

From what I have already mentioned it appears, that the heat of the wells of Kingston in Jamaica is about 30 degrees hotter than the wells in the neighbourhood of London, and the difference of the heat of the air is nearly the same. Kingston in Jamaica, where the mean heat of the wells and air is 80, is about 17° north of the equator, and London about 51°; the difference, therefore, between London and Kingston is 34°, so that the heat of the wells and air, on a medium, increases from London to Kingston about one degree of heat to every degree of latitude*. Hence might we not, with some degree of probability, infer, that as the increase of heat in 34° of latitude is 30, the heat in 17° of latitude may increase at least 10°; and if it did, it would make the mean heat at the equator 90 degrees. And, for my own part, I am strongly inclined to think, that at the centre of the globe the mean heat of the air, as well as of the earth, is about 90 degrees of Fahrenheit's thermo-

* And so it does between Edinburgh and London.

meter,

meter, and, perhaps, at the poles the mean cold is as low as 0.

Africa, as it were, stands in the centre of the globe, and, according to geographers, it is 4300 miles long, and 3500 miles broad; and, from the best accounts we have, it is the hottest country in the world.

“ As the equator divides this extensive country almost in the middle, and the far greatest part of it is within the tropics, the heat in many places is almost insupportable to an European, it being there increased by the reflection of the sun's rays from vast deserts of burning sands. The coasts, however, and banks of rivers, such as the Nile, are generally fertile; and most parts of this region are inhabited, though it is far from being so populous as Europe or Asia. In many parts of Africa snow never falls in the plains, and it seldom lies but on the tops of the highest mountains. The natives in these scorching regions would as soon expect that marble should melt and flow in liquid streams, as that water, by freezing, should lose its fluidity, be arrested by the cold, and, ceasing to flow, become like the solid rock.

“ The annual exportation of poor creatures from Africa hath exceeded 100,000, many of whom are driven a thousand miles to the sea-coast, their villages having been surrounded in the night by an armed force, and the inhabitants dragged into perpetual captivity. Those, who commit trespasses against their laws, are, at the decision of twelve elders, sold for slaves for the use of their government, and the

support of their chiefs. Theft, adultery, and murder, are the highest crimes; and whenever they are detected, subject the whole family to slavery. But any individual condemned to slavery for the crime of his relation, may redeem his own person by furnishing two slaves in his room; or, when a man commits one of the above cardinal crimes, all the male part of his family are forfeited to slavery—if a woman, the female part is sold: This traffic in crimes makes the chiefs vigilant. Nor do our planters who purchase them, use any pains to instruct them in religion, to make amends for the oppression thus exercised on them. I am sorry to say, they are naturally averse to every thing that tends to it; yet the Portuguese, and French, and Spaniards, in their settlements, succeed in their attempts to instruct them, as much to the advantage of commerce, as of religion. It is for the sake of Christianity, and the advantages accompanying it, that the English slaves embrace every occasion of deserting to the settlements of those nations.

“It is high time for the legislature to interfere, and put an end to this most infamous of all trades, so disgraceful to the Christian name, and so repugnant to the principles of our constitution. Let the negroes in our islands be properly treated, made free, and encouragement given to their population—measures that would be attended with no less profit than honour *.”

* Guthrie's Geography.

Africa, comparatively speaking, is but little known, modern travellers having penetrated no great way into its interior parts ; so that we are not only ignorant of the bounds of its interior parts, but even of the names of several of the inland countries. From the best and latest accounts we have of the inhabitants of Africa, they are frequently at war with one another. This is not much to be wondered at, when we see the professed Christians and enlightened philosophers of Europe causing the fields to swim with the blood of each other.

In the year 1788 a number of noblemen and gentlemen formed themselves into a society for the purpose of promoting the discovery of the inland districts of Africa ; and they have published their proceedings, which I have read ; but it does not appear that they have yet made any great progress. In page 90 of their book it is said, “ The heats of Fezzan, which begin in April, and continue till November, are intense ; that from 9 in the morning till sunset the streets are only frequented by the labouring people, and even in the houses respiration would be difficult, if the expedient of wetting the apartments did not furnish its salutary aid. Of this torrid climate the fierceness is chiefly felt from the month of May to the end of August, during which period the course of the wind is usually from the E., the S. E., and the S. W. ; and though from the two latter points it blows with violence, the heat is often such as to threaten instant suffocation ; but if it happens to change, as for a few days it sometimes does, to

the west or to the north-west, a reviving freshness immediately succeeds." Fezzan, according to the map which the society has given, lies between 25° and 30° of north latitude.

Mr. Brydone, in his Travels through Sicily, found the thermometer rise to 112. This happened when the wind blew from the south-east, which is called there the *sirocco* wind, and which is supposed to arise from the lands of Africa, in the neighbourhood of Syria. Mr. Jones says, that if the heat of this was such as has been reported by Mr. Brydone, it is probably the hottest air that has yet been observed with any accuracy in the known world. However, we find a more modern writer than Mr. Jones give an account of a greater degree of heat in the air than that mentioned by Mr. Brydone: I mean Mr. Bruce, from whose Travels I shall give the following extract:

"Chendi, by repeated observations of the sun and stars made for several succeeding days and nights, I found to be in latitude $16^{\circ} 38' 35''$ north; and at the same place, the 13th of October, I observed an immersion of the satellite of Jupiter, from which I concluded its longitude to be $33^{\circ} 24' 45''$ east of the meridian of Greenwich. The highest degree of the thermometer of Fahrenheit in the shade was on the 10th of October at one o'clock P. M. 119° , wind north; the lowest was on the 11th at midnight, 78° , wind west, after a small shower of rain. The degree of the thermometer does not convey any idea of the effect the sun has upon the sensations of the body or colour of the skin. Nations of blacks live within latitude

titude 13° and 14° , when, 10° south of them, nearly under the line, all the people are white, as we had an opportunity of seeing daily in the Galla, whom we have described. Cold and heat are terms merely relative, not determined by the latitude, but by the elevation, of the place. When, therefore, we say hot, some other explanation is necessary concerning the place where we are, in order to give an adequate idea of the sensation of that heat upon the body, and the effects of it upon the lungs. The degree of the thermometer conveys this very imperfectly : 90 is excessively hot at Loheia in Arabia Felix ; and yet the latitude of Loheia is but 15° , whereas 90 at Sennaar is, as to sense, only warm, although Sennaar, as we have said, is in latitude 13° . At Sennaar then I call it cold, when one, fully clothed and at rest, feels himself in want of fire ; I call it cool, when one, fully clothed and at rest, feels he could bear more covering all over, or in part more than he has then on ; I call it temperate, when a man, so clothed and at rest, feels no such want, and can take moderate exercise, such as walking about a room without sweating ; I call it warm, when a man, so clothed, does not sweat when at rest, but upon moderate motion sweats, and again cools ; I call it hot, when a man sweats when at rest, and excessively on moderate motion ; I call it very hot, when a man, with thin or little clothing, sweats much though at rest ; I call it excessive hot, when a man, in his shirt at rest, sweats excessively, when all motion is painful, and the knees feel feeble as after a fever ; I call it excessive hot, when the strength fails, a dis-

position to faint comes on, and a straitness is found in the temples, as if a small cord was drawn tight round the head, the voice impaired, the skin dry, and the head seems, more than ordinary, large and light.

“ At Sennaar from 70 to 78 in Fahrenheit is cool ; from 79 to 92 temperate, at 92 begins warm. Although the degree of the thermometer marks a greater heat than is felt by the body of us strangers, it seems to me that the sensations of the natives bear still a less proportion to that degree than ours. On the 2d of August, when I was lying perfectly enervated on a carpet in a room deluged with water, at twelve o'clock, the thermometer at 116, I saw several black labourers pulling down a house with great vigour, without any symptoms of being at all incommoded.”

When the air is heated to 116 degrees, the evaporation must be great* ; so that Mr. Bruce, in that case, I think, must have been as if in a hot bath

* Dr. Watson, in his Chemical Essays, says that 1973 gallons of water can be raised from an acre of ground in twelve hours, when the heat at the surface of the ground is 96.

“ During the extreme heat of the wind from the land, I have seen the mercury in Fahrenheit's thermometer rise in the shade to 114 degrees. I have known several instances of persons dying suddenly during the heat ; yet these accidents were to be ascribed to intemperance, or to their exposing themselves improperly abroad, rather than to the sole and immediate heat of the weather, which is not thought dangerous, or even unhealthy, to those who live with moderation, and do not go out in the excessive heat of the day.” See Sketches relating to the History, &c. of the Hindoos, p. 411.

bath-

bath. I do not recollect to have read in Bruce's Travels of what heat the springs or wells are in the countries of Africa through which he travelled. He tells us of his drinking of the water of the source of the Nile, but does not say whether it was warm or cold. The taking notice of the heat of the waters in foreign hot countries seems to have been omitted by many travellers.

By some accurate observations that were made on the heat of Bath and Bristol water by Mr. Canton, it appears that a thermometer held in the stream from the common pump of the King's bath, after pumping about half an hour, was raised to 112, and the stream from the common pump of the hot bath raised it to 114.

Buxton water has been observed to raise the thermometer to 80, and that of Matlock to 66 or 68. Dr. Falconer states the heat of the Bath waters, as they are commonly drank, of the King's bath 116, and of the Hot bath 116, of the Cross bath 112. I have read of springs being so hot that their water would boil eggs, &c.

There are several different thermometers in use among gardeners and others; but Fahrenheit's is the most general, and undoubtedly the best.

In my journal I have set down what sort of weather we had on every day, and the changes at or near about every hour of the day, at Addiscombe Place, during one year.

In the weather all mankind are less or more interested, and they seldom fail to make known their

their anxieties by bringing it into conversation, when no other subject is going forward. In the course of his labours the farmer is obliged to be conformable to it; the journies of the traveller is regulated by it; to the sailor it is matter of life and death; armies are greatly concerned in it; and the gardener, in his labours and productions, is no less affected by it than either.

After all the knowledge which men can acquire, they will still remain under much uncertainty; but they may acquire so much as may be the means of avoiding much inconvenience. If the heat and cold of the weather depended entirely on the course of the year, and if the heat of climates were dependant on their latitude, then the weather might be brought to some regular theory. However, as general rules, in this part of the world, are subjected to many interruptions, in this case we are at a loss to-day to know what sort of weather to-morrow may bring forth; for the weather depends on causes with which we are but little acquainted. Therefore, instead of having principles and rules to direct us, as in other sciences, we are obliged to betake ourselves to the arts of prognostication, and it is a work of time and great observation to attain any skill in it, though every person, arrived at the years of maturity, pretends to some degree of it.

In general, the spring and autumn are mild, the summer warm, and the winter cold; but rains and showers, winds and storms, mists and vapours, are uncertain and occasional. The south and south-west winds

winds are in general warm, because they blow from a warm country; the north wind is cold, because it blows from a cold country; the east and north-east winds are dry, cold, and blighting, because they blow over the high mountains of the continent; but it is still a matter of doubt what sort of weather is likely to attend the winds.

When covering up the cucumber frames in the evenings, I take a view of the sky, from which I form an idea of what sort of weather is likely to happen in the night, and regulate the coverings and air accordingly; and sometimes at nine or ten o'clock at night I alter the air, by increasing or reducing it, so that it may correspond with the temperature of the night, as nearly as can be guessed at.

The best rule we have for predicting the weather is the instrument called a Barometer, which was invented by Torricelli, as we are informed, in the year 1643.

An ingenious author observes, that, by means of the barometer, we may regain the knowledge which still resides in brutes, and which we forfeited by not continuing in the open air, as they generally do, and, by our intemperance, corrupting the crasis of our organs of sense.

The following are Mr. Patrick's observations on the rising and falling of the mercury. They seem to be very just, and are to be accounted for on the same principles with those of Dr. Halley:

"The rising of the mercury in general presages fair weather; and its falling, foul weather, as rain,
C 6
snow,

snov, high winds, and storms. In very hot weather the falling of the mercury indicates thunder ; in winter, the rising presages frost ; and in frosty weather, if the mercury falls three or four divisions, there will certainly follow a thaw ; but in a continued frost, if the mercury rises, it will certainly snow.

“ When foul weather happens soon after the falling of the mercury, expect but little of it ; and, on the contrary, expect but little fair weather when it proves fair shortly after the mercury has risen. In foul weather, after the mercury rises much and high, and so continues for two or three days before the foul weather is quite over, then expect a continuance of fair weather to follow.

“ In fair weather, when the mercury falls much and low, and thus continues for two or three days before the rain comes, then expect a great deal of wet, and probably high winds.

“ The unsettled motion of the mercury denotes uncertain and changeable weather.

“ You are not so strictly to observe the words engraved on the plates (though, for the most part, it will agree with them), as the mercury’s rising and falling ; for if it stands at *much rain*, and then rises up to *changeable*, it presages fair weather, although not to continue so long as it would have done if the mercury were higher ; and so, on the contrary, if the mercury stood at *fair*, and falls to *changeable*, it presages foul weather, though not so much of it as if it had sunk down lower.”

From

From these observations it appears that it is not so much the height of the mercury in the tube, that indicates the weather, as the motion of it up and down. Wherefore, to pass a right judgment of what weather is to be expected, we ought to know whether the mercury is exactly rising or falling; for which end the following rules are to be observed:

If the surface of the mercury is convex, standing higher in the middle than at the sides, it is generally a sign that the mercury is rising.

If the surface of the mercury is concave, or hollow in the middle, it is sinking.

If it is plain or level, or, rather, if it is a little convex, the mercury is stationary; for mercury being put into a glass tube, especially a small one, will naturally have its surface a little convex; because the particles of mercury attract each other more forcibly than they are attracted by glass.

If the glass be small, shake the tube, and if the air be grown heavier, the mercury will rise about half the tenth of an inch higher than it stood before; if it is grown lighter, it will sink so much. This proceeds from the mercury sticking to the sides of the tube, which prevents the free motion of it, until it is disengaged by the shock. Therefore, when an observation is to be made by such a tube, it ought always to be shaken first; for sometimes the mercury will not vary of its own accord until the weather it ought to have indicated be present. Dr. Derham says that the variations of the barometer are greatest nearest the pole; in places near the equinoctial there is scarce

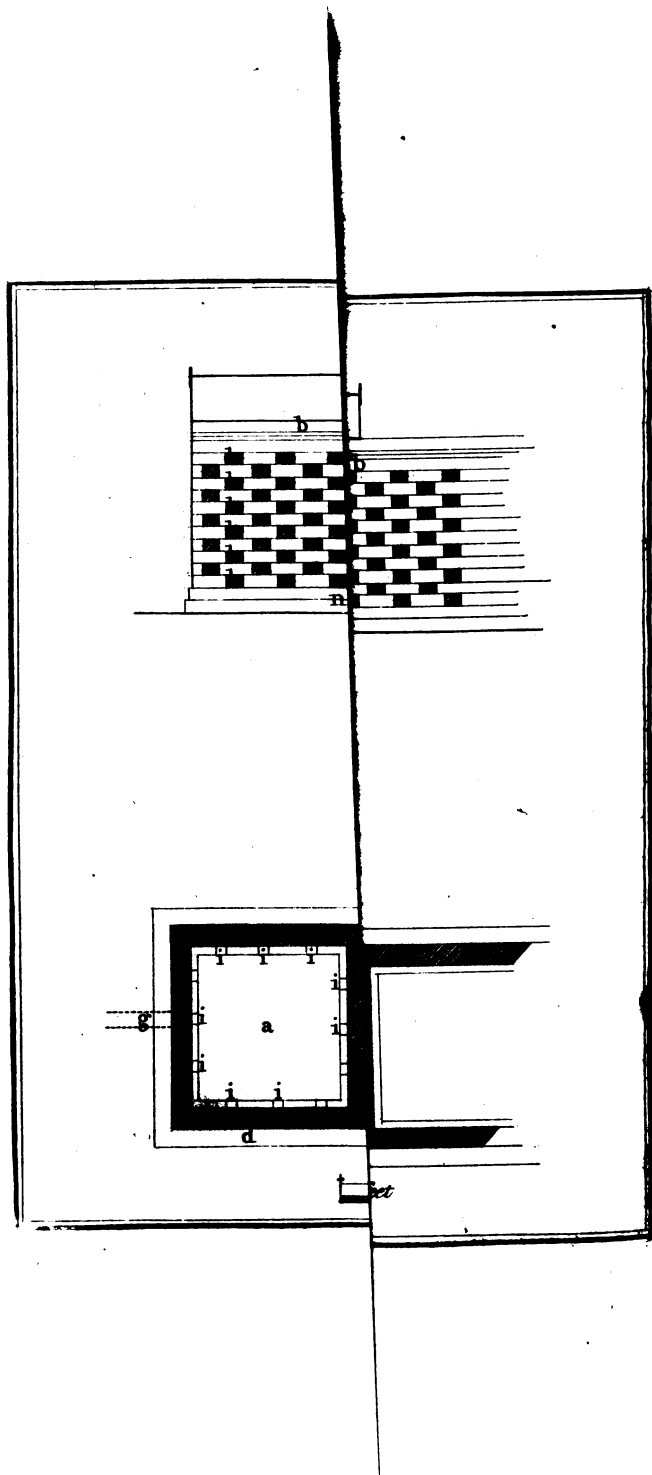
scarce any variation at all. A thick dark sky, lasting for some time without sun or rain, generally becomes fair, then foul. A change in the warmth of the weather is generally followed by a change in the wind.

Most vegetables expand their flowers and down in sunshiny weather, and towards the evening and against rain close them again, especially at the beginning of their flowering. This is visible enough in the down of the dandelion and other downs, and eminently in the flowers of pimpernel. The rule is, if the flowers be close shut up, it betokens rain, and if they be spread abroad, fair weather. The stalks of the trefoil swell against rain, and the like may be observed, though not so sensibly, in the stalks of most other plants.

When a lowering redness is spread far upwards from the horizon, either in the morning or in the evening, it is generally succeeded by rain or wind, and sometimes by both. When black clouds move contrary to the wind, it is likely the wind will soon change, and rain follow. When the clouds scatter and disappear, or dissolve in the air, it is a sign of fair weather. The rainbow in the clouds prognosticates showery squally weather. Black clouds, collecting and augmenting in the air under other clouds, portend wind and rain. When the sun sets in a bank of black watery-like clouds, it augurs foul weather. When the rays of the sun, breaking through the clouds, are visible in the air, and the air seems filled with vapours, it betokens rain and showery weather. When the sky is overcast with lofty light clouds which appear

pear stationary, and the sun appears faintly through the clouds, it is likely there will be a change of weather. A circle round the sun or moon indicates a change of weather. I have frequently observed the earth and grass almost entirely covered with threads like those of spiders; after which, dry weather has constantly for a time succeeded. These threads cannot be visibly seen but when the sun shines, nor unless a person stand with his face towards the sun. I am now writing on the 21st day of October, and there has been no rain here * since the 2d, and on every sunshiny day since that time I have observed the earth and grass covered with these threads. One day the beginning of last week I was about sowing a field with wheat, which field had been under fallow the preceding summer; and I observed the surface of the land, both before and behind the harrows, covered with these threads, suspended between the clods, waving and sparkling in the rays of the sun. How these threads came to be extended from clod to clod in so short a time after the ground was moved by the harrows, is what I cannot rightly comprehend, therefore must leave it for the decision of philosophers.

* At Addiscombe Place.



ON THE CULTURE OF THE CUCUMBER.

THE Cucumber, *cucumis* in botany, is a genus of the *monocotyledon* class. Its characters are these: It hath male and female flowers on the same plant, which are bell-shaped, of one petal, which adheres to the empalement, and is cut into five rough segments. The male flowers have three short stamina, which are inserted in the empalement; the female flowers have no stamina, but have three small pointed filaments without summits. The germen is situated under the flower, which afterwards becomes an oblong fruit with three cells, containing oval flat-pointed seeds.

There are, I believe, only three species of the cucumber, the common, the white, and the long Turkey, but there are many varieties.

The long green cucumber with black prickles, I think is the best for forcing. I have a very good sort of it; which I have had for eleven or twelve years, and which, when fit for the table, runs from six to twelve inches long, and, when ripe, runs to about eighteen or twenty inches long.

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I cannot

I cannot tell of what climate the cucumber is a native, but I imagine it is a native both of Asia and Africa. It is above three thousand years since mention was first made of it ; for in the eleventh chapter of the Fourth Book of Moses, called Numbers, it is thus recorded : “ And the mixt multitude that was among them fell a-lusting, and the children of Israel also wept again, and said, Who shall give us flesh to eat? We remember the fish which we did eat in Egypt freely, the cucumbers, and the melons, and the leeks, and the onions, and the garlic.” From this we may infer that the cucumber in those days grew plentifully in Egypt : It is, therefore, not improbable but Egypt may be its native country.

Egypt lies between the 20th and 32d degree of north latitude, and between the 28th and 36th degree of east longitude ; and, with regard to the temperature of the weather in it, in April and May the air is hot and often infectious, and the inhabitants are almost blinded with drifts of sand. Those evils are remedied by the rising and overflowing of the Nile.

“ Whoever is in the least acquainted with literature knows that the vast fertility of Egypt is owing to the annual inundation of the Nile, occasioned by the rains which fall during May, June, and July, in Abyssinia, and the neighbouring countries of Africa. According to Mr. Volney, the commencement of the inundation is not entirely ascertained, though the Copts fix it at the 19th of June. At the height of its flood in the lower Egypt nothing is to be seen in the plains but the tops of forest and fruit trees, their towns

towns and villages being built upon eminences either natural or artificial. When the river is at its proper height the inhabitants celebrate a kind of jubilee with various festivities.

“ The banks or mounds that confine it are cut by the Turkish Basha, attended by his grandees ; but, according to captain Norden, who was present on the occasion, the spectacle is not very magnificent. When the banks are cut, the water is let into what they call the Chalis, or grand canal, which runs through Cairo, from whence it is distributed into cuts for supplying their fields and gardens. This being done, and the waters beginning to retire, such is the fertility of the soil, that the labour of the husbandman is next to nothing. He throws his wheat and barley into the ground in October and May, he turns his cattle out to graze in November, and in about six weeks nothing can be more charming than the prospect which the face of the country presents, in rising corn, vegetables, and verdure of every sort. Oranges, lemons, and fruits, perfume the air. The culture of pulse, melons, sugar canes, and other plants which require moisture, is supplied by small, but regular, cuts from cisterns and reservoirs. Dates, plantanes, grapes, figs, and palm-trees, from which wine is made, are here plentiful. March and April are the harvest months, and produce three crops, one of lettuces and cucumbers (the latter being the chief food of the inhabitants), one of corn, and one of melons.

“ The Egyptian pasturage is equally prolific, most of the quadrupeds producing two at a time, and the sheep four lambs a year *.”

In England, and especially near large cities and towns, great quantities of cucumbers are raised. Not only gentlemen, but almost every tradesman who has a garden and dung, have their cucumber frame. In the summer time the market gardens round London produce vast quantities to supply that extensive metropolis.

The *Historia Plantarum*, published under the name of Boerhaave, informs us, that if the branches of cucumbers are much trodden upon, the fruit will be bitter and emetic ; and that a water distilled from cucumbers, when full ripe and beginning to putrify, purges smartly in the quantity of a drachm.

I myself have often found cucumbers bitter in taste; which bitterness I conceive is occasioned in them through the want of proper food ; and the proper food of a cucumber plant is contained in sweet earth, sweet air, sweet water, and a sufficiency of heat.

I have been told that the cucumber is one of the four great coolers of the shops, and that it is almost an universal ingredient in emulsions, and is found of service in fevers and nephritic complaints.

“ The Galenists hold them to be cold and moist in the second degree, and then not so hot as either lettuce or purslain. They are excellent good for a hot stomach and hot liver ; the immeasurable use of them fills the

* Guthrie's Geography.

body full of raw humours, and so indeed the immeasurable use of any thing else doth harm. The juice of cucumbers, the face being washed therewith, cleanseth the skin, and is excellent good for hot rheums in the eyes. It is usual to use the seeds in emulsions, as they make almond milk; but a far better way, in my opinion, is this: When the season of the year is to take the cucumbers, bruise them well, and distil the water from them; the face being washed with the same water cureth the reddest face that is.

“It is also excellent for sun-burning, freckles, and the morpew.”

A warm situation, sheltered from the winds by buildings, sheds, or thickets, and groves of trees, is of great advantage, and necessary for a cucumber bed to stand in; for were it fully exposed to, and unprotected from, the high and piercing winds, especially in the winter and spring months, there would be but little probability of constant regular success. For when high winds are suffered to blow against a cucumber bed, they have a very powerful effect on it; for in that case the heat in a short time will not only be greatly abated, but also forced and driven into the corners of the frames, and consequently some parts thereof are rendered too cold, whilst other parts are made too warm; and of course the plants are all equally endangered, retarded in their growth, and perhaps some, if not all of them, totally destroyed. Therefore, when a cucumber bed is about to be built, the first object of consideration should be,

to have it, as well as possible, sheltered from the high winds and boisterous stormy weather.

That the bed be not by any thing whatever obstructed from the genial or warm and nourishing rays of the sun, is another object of great importance. For although artificial heat will cause the seeds of cucumber plants to vegetate and spring forth, yet that vegetable can be brought to no degree of perfection without the influence of the sun, and even his rays are at times absolutely necessary. However, it will be found sufficient, if, in the shortest days in winter when the sun shines, he be not hindered from shining on the frames from about ten o'clock in the morning till about two in the afternoon.

It is also worth consideration to have the bed built in or near to the kitchen garden, so that it may be handy to carry from thence the rotten expended dung to such quarters of the garden as may require to be manured. Regard also should be had that nothing stand in the way to hinder carts or waggons from bringing the warm dung near to the place in which the bed stands.

There are two sorts of earths or moulds, without which, or a part of one or the other, I apprehend, a cucumber plant will not grow vigorous, nor produce fruit plentifully. The one is animal mould, the other is vegetable mould, and which are in fact nothing else but the putrefaction of earth after it has been altered by passing through the animal and vegetable vessels.

What

What I mean by animal mould is the dung of horses or of cows, after it has undergone a fermentation by being used for the rearing melons or cucumbers, and has afterwards lain in a heap exposed to the sun and air, and been frequently turned and well worked, till it has become a black, light, rich mould *. But among such moulds are always considerable quantities of vegetables, such as hay, straw, and perhaps weeds of different sorts, which have not passed through animal vessels; therefore it is a composition of dung and rotten vegetables. In this sort of mould cucumber plants will grow remarkably strong; but I think it is rather too rich, and therefore those who use it had better mix it with some light soil, which has no unpleasant or disagreeable smell.

That which I call vegetable mould is what is made of the leaves of trees. The method I take to make it is this: In the months of December or January, or when the leaves are in a decaying state and wet, I have them raked together, and laid in a heap as large as will raise a moderate heat; and during the spring and summer months I have them frequently turned and well worked, and by October and November following they are rotten and fit for use: But if they are suffered to lie for a longer space of time before using, their mould is still better, because it will have become more rotten, and of a more solid tex-

* Perhaps with more propriety may the earth of bones, flesh, horns, and skins, be called animal mould. When such things are by putrefaction reduced to earth, it undoubtedly contains much of the food of plants.

ture, and therefore will not sink so much after being put into the frames, as if put in when less rotten.

The leaves of which I make the vegetable mould, are a mixture of the elm, lime, beech, fycamore, horse and sweet chefnut, spruce and Scotch fir, walnut, laurel, oak, evergreen oak, ash, &c. and among them are withered grass and weeds of various sorts. This vegetable mould, without a mixture of any thing besides, is what I use for growing cucumbers in, and, by experience, I find it preferable to any other moulds, earths, or composts whatever, either in my new method of a brick bed, or in the old method of a bed made of hot dung.

Before I use the mould I have it run through a coarse screen or sieve to free it of the bits of sticks, and of the cones and tree seeds, such as that of the horse chefnut, and of the spruce and Scotch fir.

Cucumbers will grow in almost any sort of mould, though not with the same degree of vigour, provided they be supplied with a sufficiency of heat, water, and air.

In Britain, especially in the winter and spring months, one of the principal causes, without which cucumbers cannot be produced, is deficient, and that is, heat. In every county, and in every parish, and in every month of the year, earth, water, and air, may be found; but in every part, even in the most southern counties of England, there is a deficiency of heat: For, as far I know, that vegetable called cucumber, does not, in any part of this country, come to any degree of perfection without some assistance

assistance of artificial heat. Therefore, as the natural heat of this climate is deficient in its production, those who wish to have it in perfection, must have recourse to art to supply the insufficiency of nature.

Late in the spring, and in the summer months, the heat of tan, or of the leaves of trees, may do ; but in the winter and early in the spring, something that raises a more powerful heat than these is required.

A place could be so constructed that cucumbers might be cultivated therein by means of the steam of water ; but it would, I apprehend, be attended with such expense that few would be willing to adopt the method, even supposing it were found to answer the purpose better than dung ; which I am inclined to think it would not do, because I conceive that the heat which is produced by fire, cannot be kept so steady as that which is produced by the fermentation of dung.

Cucumber plants will grow in a hot-house where the pine-apple is cultivated ; but they will not be very long-lived there, for that is not a healthy climate for them.

Dung is the only thing yet found out, by the heat of which the cucumber may be advantageously cultivated.

It is not possible, nor is it necessary, to keep the air in the frames always up to the same degree of heat ; but extremes on either side are dangerous, and should be carefully avoided.

There

There is no necessity for having heat directly underneath the roots of the plants ; for if the air in the frames be kept up to a proper degree of heat, that is sufficient. In climates where the cucumber naturally grows, I apprehend there is no heat in the earth but what is raised in it by the heat of the sun and the circumambient air, which seems to be warmed by the reflection of the sun upon the earth.

It is not only necessary that in the frames the air be kept up to a sufficient degree of heat, but it is absolutely necessary that nothing pernicious or unwholesome be conveyed into, or caused to arise in the frames among the plants by means of that heat. If the steam of the linings get in, it will hurt the plants ; and if there be any thing which smells disagreeably in the mould or underneath the mould in the frames, the heat of the linings will cause unhealthy vapours to ascend from it, which in time will prove injurious to the plants. So that although there may be a degree of heat in the frames strong enough for the growth of the plants, yet, through means of that heat, something may arise in the frames which will become progressively, if not almost instantaneously, destructive of the plants, especially when they are young and tender. Care, therefore, must be taken that nothing be introduced into the frames among the plants but what is of a sweet wholesome nature.

If it were possible to keep the heat in the frames always to 80 degrees, with the concurrence of proper air and moisture, I am of opinion that that would be a sufficient heat for the production of the cucumber.

In

In the short days in winter little or no water is required, for the continual evaporation arising in the frames, and perspiration of the plants caught by the glasses, keeps dropping down again upon the mould, and, in some degree, imitates a natural watering from the clouds, and which is of service to the plants. Hence it would seem that the plants are often watered with the same water.

The mould in the pits retains the moisture surprisingly, which perhaps may be owing in some measure to the pits being constantly surrounded with the moist steam of the linings; and the bricks of the pits, and the tiles that cover the flues, being porous for aught I know, moisture, by the force of evaporation or attraction, gets through them into the frames. But be that as it may, I know that nothing hurtful or unhealthy ever gets through the tiles or bricks into the frames among the plants. The quantity of water requisite to be given to the plants depends upon the heat of the bed, the strength and age of the plants, and also on the temperature of the weather. When the weather is cold, wet, or gloomy, and the air moist, they require less water than when the weather is clear, and the air more dry.

If too much water be given, it will hinder the fruit from setting and swelling kindly; and if too little water be given, the plants will grow weak, and the fruit hollow.

I never wish to water the plants with water warmer than 85 degrees, nor colder than 65. Although, in general, I try by the thermometer the warmth of
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the water I use, yet it is not necessary so to do. A good way to know if the water be of a proper temperature is to take your mouth full of it, and when it feels neither hot nor cold, then it is in a fit state, for accelerating the growth of the plants, or for making them grow fast. I make it a constant rule never to water the plants but with clean sweet water; and if the water be clean and sweet, I am of opinion it makes little or no difference whether it be pump water, spring water, rain water, or river water. However, it is a good quality in water to bear soap, and make a lather therewith, which rain and river water readily do; but the pump and spring waters are found too hard to do it; yet this may easily be remedied in them, by letting them stand a few days in the open air and sun's rays.

With regard to the time of the day in which the watering of the plants ought to be performed, I think it is not material, nor do I ever make any rule with respect to the time; but give them water at any hour of the day when I see they stand in need of it, and when it best suits my conveniency. Those who have hot-houses may get their water warmed there, and those who have no hot-houses may get some from the house, or from some other place where water is frequently heated. One gallon of hot water will properly warm several gallons of cold water. Late in spring and in the summer months the water may be warmed by exposing it to the rays of the sun.

A due proportion and continual supply of fresh air is at all times necessary, and more or less is required

quired according to the heat of the linings, the temperature of the weather, and the thickness of the coverings put on at nights.

When I say, *give air*, I mean that the lights should be raised or tilted on the north side with pieces of wood made in the form of wedges, by means of which little or much air can be admitted at pleasure.

The lights or sashes of frames or boxes are seldom or ever made so exact as altogether to exclude the external air, or to hinder it from having a continual ingress and egress, or from going in and coming out of the frames continually. And as the frames get old they wear, and then let in more air than when they are new, so that new frames may require the use of the air-sticks when old frames do not; therefore, in giving air, these and such like matters ought always to be duly considered.

When the wind blows from the east and north-east, the current of air goes in at the westernmost light of each frame, and comes out at the easternmost one; and when the wind blows from the west and north-west, it is just the reverse, for it then goes in at the easternmost light of each frame, and comes out at the westernmost one. That being the case, it is sometimes advisable to give less air at the light where the air goes in, than at that at which it comes out; for when the wind blows strong from those quarters, as well as from the south-west and south-east, the end lights of each frame next to the quarters from whence the wind blows, will be the warmest.

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The air and heat in the frames are always most regular and steady when the wind is calm, or the bed well protected, and when the wind is in the south or in the north; but when the wind blows strong from any of the other quarters, and is suffered to beat upon any part of the bed, the current of air will be irregular, and at times very strong; and if there then happen to be a strong new lining at the bed, and a great rank steam arising out of it, especially at the north side, care, skill, and attention will be required, and must be exerted, for the preservation of the plants; for the steam being nigh to the place where the air is admitted, if much air be given while the wind continues high, the steam will undoubtedly be carried by the current of air into the frames, and if the steam be of a pernicious quality, the plants will certainly be hurt thereby. When such a case happens with me, I give but little or no air in the night time, and by frequent waterings I keep the steam of the linings down in the day-time; and this I continue to do till the winds subside, or till the violent fermentation of the linings be somewhat abated. But if the bed be well sheltered, such precautions will be unnecessary, for I have never experienced any hurtfulness in the steam arising out of the linings, except when the winds have been blowing strongly on the bed, and soon after the application of a powerful new lining of rank horse-dung, and when it was high up against the sides of the frames near to the place where the air was given; and even then

then the plants were not killed, but only some of their leaves injured.

As the steam rises out of the dung of the linings it is quickly dispersed and mixed with the common air, by which its pernicious qualities are almost instantaneously destroyed. It is, therefore, not likely that the steam arising from the linings on the outside of the frames should become hurtful to the plants in the frames, unless it were to pass immediately from the linings into the frames before its pernicious qualities were meliorated or destroyed.

In the frames there is a continual steam or evaporation arising; and as this vapour is of a sweet, healthy, invigorating nature, if too much air be given, it will pass off too rapidly, and that before it has had time to render to the plants that service which is necessary; and if too little air be given, the vapours will be retained too long, and become too thick, and thereby the free perspiration of the plants will be obstructed, which will soon render their state weak and sickly, and the fruit will neither set nor swell kindly.

In winter, when the heat of the linings is great, if care be not taken, the air in the frames will be rendered too dry. To prevent this, I either cover the flues thinly with moist mould, or keep them damp by watering*.

* In no part of the frame should the mould be suffered to become dry and husky. When the heat is great, water should be frequently and plentifully poured upon the flues, which will keep the bricks and mould adjoining to them in a moist state.

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In giving and taking away the air I do it gradually, that is, by little and little at a time, which, without doubt, is the best way; for, as I observed before, sudden changes are always attended with unpleasant consequences.

The linings are to be applied to the bed a few days before the plants are ready for finally planting out, in order that the mould and every thing in the frames may be properly warmed for their reception.

The dung of which the linings are to be made may either be cast together in a heap, to bring it to a heat, before it be laid round the bed, or it may be laid round the bed as it is brought from the dung-yard; but whichever of these methods be taken, when the linings are making up, the dung should be well shaken, and laid up lightly, so that the heat of it may come up freely.

The linings are to be made nearly three feet broad in their foundation, and tapered up to about thirty inches at the top, by which they will retain their heat long, and in sinking will keep close to the bed, which is what should at all times be paid proper attention to.

In the winter and spring months the linings should be trodden upon as little as possible, for treading on them would be the means of stagnating their heat. But should it at any time, in managing the plants, be found necessary to stand or kneel upon them, boards should be laid on their tops for that purpose; which will prevent the weight of a person from taking that effect on them which it otherwise would do.

As the linings sink, they are to be raised with fresh dung ; but they should seldom be raised higher than about the level of the mould in the frames in which the plants grow, especially when there is a strong heat in them ; for when there is a great heat in them, if they are kept higher than the level of the mould, the heat dries the air in the frames too much. Nor should they be suffered to sink much below the level of the mould in the frames ; for that, on the contrary, would cause too much moisture in the frames, especially in the winter and spring months.

When the heat begins to be too little, notwithstanding the linings being kept to their proper height, the fresh unexhausted dung on the top or upper part of them is to be laid aside, and the exhausted dung underneath to be taken away, and that which was laid aside put in the foundation, and fresh dung laid above it in lieu of that which was carried away.

Both the side linings may be raised at one time, but both of them should never be renewed together ; for if both were to be renewed at the same time, it would for a time cool the frames too much, and when the heat of both came to its full strength, it would probably be too powerful.

I seldom or never renew the end linings, because I find the heat of the side ones fully sufficient ; for as there are flues or vacuities in every part of the bed, the steam, being fluid, circulates in, and warms every part thereof. And for the very same reason there is no occasion for having a strong heat in both the side linings at one and the same time,

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In making up and pulling down the linings, care should be taken not to injure the brick-work.

The covering the lights in the winter and spring is absolutely necessary ; for, notwithstanding the heat of the linings, it would be impossible to keep up a proper degree of heat in the frames for the plants without coverings. Therefore, the covering up in the evenings, and uncovering in the mornings, must be particularly attended to, and more or less put on according to the heat of the linings and the temperature of the weather. My method of covering up is as follows : In the first place I lay clean single mats on the lights, in length and breadth just or nearly to cover the sashes, taking care not to suffer any part of the mats to hang over the sashes on or above the linings, for that would be the means of drawing the steam into the frames in the night-time. On these mats is spread equally a covering of soft hay, and on the hay is laid another covering of single mats, upon which are laid two, and sometimes three or four, rows of boards, to prevent the covering from being blown off by the winds. The mats laid on next to the glass are merely to keep the seeds and dust which may happen to be in the hay from getting into the frames among the plants.

In covering up, steps or short ladders must be used by those whose office it is to cover and uncover ; and great care must be taken not to break or injure the glass.

I know some gentlemen who have pits built in their cucumber and melon grounds : These they have built

built wide enough to make the bed in the middle, and room on each side of the bed for the linings. This is a very good method; but the building of such pits is attended with considerable expence; Those who have them should take care that there be drains as low as the foundations of the bed to carry off the water from it.

The method of raising the plants from seed is to be seen in the beginning * of the journal of their daily management. I shall therefore proceed to give the method I follow in stopping the plants, and in keeping them regularly thin.

When the seedling plants have one or two joints, I stop them, after which they generally put forth two shoots, each of which I let run till they have made one or two clear joints, and then I stop them; and afterwards I continue throughout the season to stop the plants at every joint; and the method I take to do it is as follows:

When the plants shoot forth again after the second stopping, they seldom miss to show fruit at every joint, and also a tendril; and between this tendril and the showing fruit may clearly be seen the rudiment of another shoot; and when the leading shoot has extended itself fairly past the showing fruit, then with my finger and thumb I pinch it and the tendril off just before the showing fruit; so that in pinching off the tendril and the shoot, the showing fruit is not injured. Thus stopping the leading shoot stops

* And also at the end. See October 5th, 1793.

the juices of the plant, and is the means of enabling the next shoot (the rudiment of which was apparent when the leading shoot was stopped) to push vigorously, and the fruit thereby also receives benefit.

When the plants are come into bearing, if the vines are suffered to make two joints before they are stopped, at the first of these joints, as I before said, will be seen showing fruit, a tendril, and the rudiment of a shoot; but at the second joint there is seldom to be seen either showing fruit or the rudiment of a shoot, but only a tendril and the rudiments of male blossoms. It is therefore evident, and but reasonable, that the shoot should be stopped at the first of these joints; for were the shoot to be let run past the first joint, and stopped before the second, perhaps no shoot would ever spring forth at the said second joint, but only a cluster of male blossoms or leaves, which would serve for no good purpose, but would rather exhaust the juices of the plant, which ought to be thrown into the productive parts of it.

If the plants are suffered to bear too many fruit, that will weaken them, and in such case some of the shoots will lose their leaders, that is, the rudiment of some of the shoots will not break forth, the numbers of fruit having deprived them of their proper share of the vegetative juices. The rudiments of some of the shoots may also be injured by accident, which sometimes prevents their pushing; but from whatever cause this happens, it matters not; for by the losing of its leader the shoot is rendered unfruitful, and therefore should be cut entirely off.

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In the course of the spring and summer months several shoots break forth here and there from the old ones. When too many break out, I cut off the weakest of them close to the old shoots, and those which I let remain I treat, with regard to stopping, nearly in the same manner as young plants.

If the old shoot, from which the new one burst forth, lie close to the mould, it soon sends forth roots from the same joint from which the young shoot proceeded, by which the young shoot is much invigorated, and the old plant, in some measure, renovated.

When this young plant is fairly formed on the old shoot, it somewhat resembles a young plant formed and struck root on a strawberry runner. And if the shoot were to be cut off on each side of the newly formed plant, and no part of the plants left in the frame but itself, by proper treatment it would soon extend itself all over the frame.

In winter, when the plants are young, and before they come into bearing, it sometimes happens that they send forth too many shoots: In that case I cut the weakest of them off, not suffering them to become crowded and thick of vines, for that would weaken and prevent the plants from bearing so early as they ought to do.

The leaves of the plants I always keep regularly thin. The oldest and worst of them I cut off first, and I cut them off close to the shoot on which they grow. This is necessary and right; for if any part of the

stem of the leaf were to be left, it would soon putrify, and raise unhealthy vapours among the plants.

It is the female blossoms or flowers that bear the fruit; but if they were not to be impregnated by the male flowers, they would prove barren and unfruitful.

The female blossoms are easily to be distinguished from the male ones, for the rudiment of the fruit is apparent at the bottom of the female flowers, and the flowers have no stamina, but have three small pointed filaments without summits: Whereas the male blossoms have not any rudiment of fruit about them, but in the centre of the flower are three short stamina, which are inserted in the impalement.

When the female or fruit blossoms are in full blow, I take a male blossom which is in full blow, and holding it in one hand, with the other I split and tear off the flower leaves or petals, taking care not to hurt the stamina or male part. I then hold the male blossom thus prepared between the finger and thumb of my right hand, and with my left hand I gently lay hold of the female blossom, and holding it between two fingers, I put the prepared male blossom into the centre of the female blossom, and there the farina, polen, or dust of the anthera, clings or sticks to the stigma, and thus the impregnation of the fruit is effectuated, and the plants are thereby rendered fruitful, which, being in frames in a climate by art made for them, would otherwise in a great degree be rendered barren and unproductive; and which I have

have frequently known to have been the case, even when at the same time the plants were in a vigorous flourishing state.

I generally leave the prepared part of the male blossom sticking in the centre of the female one, and take a fresh male blossom to every female blossom. But if male blossoms run scarce, which seldom or never happens, I make one male blossom do for two or three female ones.

When the frames are going to be set upon the bed, a layer of mortar is spread all round upon the upper course of brick-work on which the bottoms of the frames are to rest. Thus the frames are set in mortar on the bricks; and the flues are with a brick-layer's brush well washed, and rubbed with a thick grout made of lime and water, which stops every crack or hole, and prevents the steam of the linings from getting into the frames. This washing of the flues I have done at least once a year, and oftener, if need be, for no crack or hole is ever suffered to remain unstopped in the flues.

I find little or no trouble in keeping the flues perfectly close, nor is it indeed likely that they should become troublesome if the bed stands on a sound foundation, for the heat of the dung has not that powerful effect on the flues, as fire heat has on the flues of a hot-house; because the heat of dung is more steady and not so violent as the heat of fire; and besides, the flues of the cucumber bed are almost always in a moist state, which is a preventative in them against cracking or rending.

When the bed is first built, the pits are about three feet in depth below the surface of the flues. These pits I have filled up about a foot high, some of them with rough chalk, some of them with small stones, and some of them with brickbats * : This is to let the wet drain off freely from the mould of the beds. After this filling up with chalk, stones, and broken bricks, there is a vacancy in the pits about two feet deep below the surface of the flues ; this vacancy I have filled to a level with the surface of the flues with vegetable or leaf mould ; and in putting it in, it is gently pressed, to prevent it from sinking too much afterwards.

On the surface of the mould which the pits are filled with, under the middle of each light, and which is just in the centre of the mould in each pit, I make hills of mould in the same form as is commonly done on a dung bed. These hills are to set the plants in, and are raised at first nearly close to or within a few inches of the glass. Raising the mould at first pretty nigh the glass is necessary on account of the sinking of it ; for as the frames are set on bricks they cannot sink, but mould newly put in is sure to settle, and the measure of settlement will ever depend upon the lightness and texture of the mould with which the pits are filled. Therefore, these and such-like matters must be left to the discretion of those who are entrusted with the direction and management of the frames. When the bed is thus

* Either of these, or such like, will do equally well.

finished,

finished, and ready for the reception of the plants, if the flues be strewed over with mould, so that their surface be just covered, to a stranger it is altogether a deception, for in every respect it has the appearance of a dung bed.

The sashes of the frames which I use are glazed in lead; but if any person who rears early cucumbers have lights which are not glazed in lead, but are slate glazed, the vacancies between the glass had best be filled up close with putty, to prevent too much air from getting into the frames in the cold days in winter. The frames under my management are constantly kept in good repair, and painted over once every year. This method, I am clearly of opinion, is more profitable than if the frames were neglected for two or three years, and then have a thorough repair with two or three coats of paint. When frames are new painted, they should be suffered to lie and sweeten for some time, at least for two or three weeks, or until the disagreeable smell of the paint be somewhat lessened.

Although the frames I use are of a very good size, yet if they were a little smaller or larger, they would answer the purpose very well. Therefore those who intend to build a bed after my plan, have no occasion to make new frames merely for the purpose, but they may get the bed built to fit the frames they are already in possession of.

The common and general method of cultivating early cucumbers is the following: The seedling plants are raised nearly in the same way as I did mine
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in 1792, but few or none make use of a thermometer, nor is it absolutely necessary so to do. About three weeks before the plants are ready for planting out for good, a quantity of dung is procured, and cast up in a heap to heat, and let lie about a fortnight or three weeks, and during that time it is turned twice or thrice, and well worked. It is then made up into a bed of about four or five feet high, and the frames and lights set upon it. It is afterwards suffered to stand for a few days to settle, and until its violent heat be somewhat abated ; and when it is thought to be in a fit state for the plants to grow in, its surface is made level, and a hill of mould laid in just under the middle of each light, and when the mould gets warm the plants are ridged out in it.

After this, if the bed has become perfectly sweet, and there be heat enough in it, and the weather prove fine, the plants will grow finely ; but in the course of a few days the heat of the bed begins to decline, and perhaps the weather changes from fine, and becomes cold, wet, and gloomy ; and in that case a lining of fresh dung to enliven the heat of the bed is undoubtedly required.

When this fresh lining is applied, it sets the bed into a fresh fermentation, and very frequently gives too much bottom heat, and it even often happens that the heat becomes too great under the plants before a lining is applied ; for the heat of a dung bed is changeable, and is raised and lowered by the changes of the weather ; and every person knows how variable the weather is in this part of the world.

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When the heat becomes too powerful for the roots to grow in, the plants will show it by their sick, weakly appearance ; and if the mould on the surface of the bed under the plants be examined, it will be found of a gray colour : When this happens, it is called a burning heat.

The only methods that I have yet learned, or ever heard of, either for preventing or for curing this burning heat of the bed, are four. The first of these is, giving plenty of air ; the second is, making holes in the sides of the bed ; the third is, taking the burnt or over-heated mould out from under the roots of the plants, and putting fresh mould in its stead ; and the fourth is, pouring water into the dung of the bed to quench its fiery heat.

The first of these methods is the most simple and easy to be put in practice, but it seldom answers the desired end, for much air starves the branches of the plants, while the great heat in the dung of the bed hinders the roots of the plants from making due progress.

The second method, which is making holes in the sides of the bed to lessen the great heat of it, may be of some service, but it is rather precarious. The heat passing off on the outside of the bed certainly cools the bed ; but by that means the air in the frames is liable to be made too cold, and it is not the heat of the air that is wanted to be lessened, but the heat immediately under the hills of plants.

The third method is attended with more trouble than the two former, and its operations are attended

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but with little better consequences; for the taking the mould out from under the plants disturbs their roots, and, in a few days after, if the heat of the bed be not declined, it becomes too hot again, and the same work is again required. Thus with these three methods I have kept on from October till March, and during that time have paid great attention, and exerted all my ingenuity, yet have been but little forwarder with my plants than if I had not begun to sow the seeds before the month of February; and this has not only been my case, but, to my certain knowledge, that of hundreds besides.

The fourth and last method of keeping the burning heat of the bed under, is that of pouring water into the dung of the bed. This method is the best and most effectual of the four, but in its performance skill, care, and attention, are required; and it must be executed with such nicety and circumspection, that I freely confess I am not able to give such instructions concerning it, as might at all be depended on. For if too much water be poured in, it chills the bed, and creates noxious vapours therein; and if too little water be poured in, the burning will increase; so that by running to extremes on either side, the plants are exposed to danger, retarded in their growth, and perhaps attacked by insects and by complicated diseases, which, if not removed in a short time, will bring them to an untimely end.

The effect which the linings have on dung beds causes their sides to sink, and that unevenly, especially

ally if the dung of which the bed was made, was not thoroughly worked before it was put into the bed; and in sinking, the bed is liable to rend and give way in its sides, and therefore it is difficult to prevent the steam of the linings from penetrating into the frames among the plants.

In the winter, when the heat of the bed is much declined, it is a common practice to bore holes in the sides of the bed with a stake. These holes are to enable the heat of the linings to warm the bed properly; but as the dung of the bed is of a loose texture, through these holes the steam of the linings is apt to find its way into the frames among the plants.

When the dung of the bed gets old and rotten, it stagnates, corrupts, and becomes putrid; therefore the vapours which arise from it when in such a state, cannot be of a healthy nourishing quality, but, on the contrary, are certainly unhealthy, and slowly poisonous to the plants. And if the dung of the bed become dry and husky, the vapours that arise out of it when in such a state are productive of no better consequences.

It is well known that animals, which are fed upon sweet wholesome food, are the most wholesome food for man. And no doubt but the flesh of wholesome animals may be rendered somewhat unwholesome by the nature or quality of the food they are fed with.

Vegetables are, in many respects, similar to animals, and therefore may undoubtedly be rendered somewhat unwholesome to man by the nature of the food with which they are nourished.

I shall not enter into a philosophical disquisition of the food of plants, but shall only mention what I hinted before, that the food of the cucumber plant is contained in earth, water, heat, and air, and the sweeter these elements are kept, from which the plants derive their sustenance, the more wholesome and palatable will their fruit be.

When I used to cultivate cucumbers on a dung bed, the fruit were sometimes watery and ill-tasted; but since I began to cultivate them on a brick bed, the fruit have constantly been firm and well-flavoured; which is certainly occasioned by the goodness and wholesomeness of the food with which the plants are fed or nourished.

The difference of climate, or temperature of the air, has a very great effect on plants of almost all sorts. The different degree of heat is the great cause of these changes, and different degrees of moisture undoubtedly assist it. The American and African plants, which are said to be famous in medicine, when of the growth of their native soils, yet when they are removed and brought into our climate, though they grow, and even produce their flowers and ripen their fruit, which is the last perfection of a plant, when put to the trial, it is said by skilful men, they have always been found to want their proper medicinal virtues.

Many plants and trees, though natives of another climate, will endure the open air with us, and grow in our gardens, yet lose much of their strength and become dwarfs in proportion to what they were in their
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their proper climate. But less violent changes than these are able to produce the like effects, at least in some degree ; for the several parts of Europe are able in time to alter the qualities of the same plant, even while it grows natural in them.

The differences made by varieties of climates upon plants are not always confined to distance of place, but even in the same country the climate differs greatly in different years by means of accident ; and more or less heat, and more or less moisture, will do as much violence to plants sometimes as change of place, which operates only by means of the same agents. The effect of different climates in changing the nature of things produced in them, is not confined to plants only, but the animal kingdom also shares in it.

A cucumber plant delights in sweet wholesome air ; but if the air in which it grows be contaminated, unhealthy, or impure, the plant will not continue long in a healthy flourishing condition.

Whatever is disagreeable to the smell becomes in time hurtful to the cucumber plant ; therefore, whoever would wish to know if the air in a cucumber frame be of a healthy nature for the plants, should smell to it.

All the materials of my newly-invented bed are clean and sweet ; and the flues being made perfectly close, no tainted or bad-smelling air can get through them into the bed, so that it is of little or no concern whether the dung of the linings be sweet or otherwise, or whether the linings be made of dung or of any thing

thing else, provided there be a sufficient heat kept in them.

The bed is so constructed, that the coldest place in it is exactly in the centre of each pit, and from this centre the heat increases on each side to the linings where the heat begins. The plants being planted in this centre or coldest part of the bed, their roots can never be hurt by the heat; and as it is natural for the roots to spread themselves horizontally, the heat, increasing on each side gradually, is in every respect suitable for their increase and extension.

The heat in the centre of each pit, just where the plants are first planted, seldom rises higher than to about 80 or 85 degrees, nor does it ever rise higher in any part of the pits than about 96 or 97 degrees, nor do I believe it ever can be raised higher than that, without scorching the plants by top heat or heated air; whereas in a bed made of dung, the heat in the centre of the bed under the mould in which the plants are planted, frequently rises to above 120 degrees, when, at the same time, the air in the frames can scarcely be kept up to a proper degree of heat: This frequently happens in cold weather in winter.

“ The scorching heat of a hot-bed of horse-dung, when too hot for plants, is equal to 85 degrees and more, and hereabout is probably the heat of blood in fevers.

“ The due healthy heat of a hot-bed of horse-dung in the fine mould, where the roots of thriving cucumber plants were in February, was equal to 56 degrees, which

which is nearly the bosom heat, and that for hatching of eggs. The heat of the air under the glass frame of this hot-bed was equal to 34 degrees, so the roots had 26 degrees more heat than the plants above ground: The heat of the open air was then 17 degrees *."

According to Dr. Hales the heat of the human blood in high fevers is above 130 degrees of Fahrenheit's thermometer; the bosom heat, or heat of the skin, is from 94 to 98 degrees; the heat of a hen hatching eggs is from 103 to 107 degrees. It appears that 60 degrees of Fahrenheit's thermometer is equal to about 34 of Dr. Hales's thermometer; hence we may infer, that the heat of Dr. Hales's cucumber bed stood nearly as follows: The heat of the mould in which the roots were growing 100 degrees, and the heat of the air in the frames 60 degrees. Now as the surface of the mould, which was heated to about 100 degrees, must be exposed to the heat of the air in the frame, which was 40 degrees lower, I think it is but reasonable to suppose that the heat of the dung under the mould must have been at least 120 degrees.

I am inclined to think that Dr. Hales did not himself manage this cucumber bed; for, if he had, I think he would have favoured the public with an account of how long it continued in that due healthy state, and what methods he took to keep it in that state, and of the success attending his labours with regard to the produce of the plants.

The dung for the linings of the bed of my invention requires no more working than what is need-

* Hales's Statics, vol. i. p. 60,

fary to bring it to and keep it in a proper degree of heat ; and as soon as the heat rises in the linings, it circulates in the flues, and warms every part of the bed ; whereas the dung for making a common cucumber bed must be turned and worked, and lie, till, by fermentation, its rank qualities be evaporated, and its violent heat be somewhat diminished.

In the course of the winter a dung bed sinks so low that it becomes difficult sometimes to get a proper heat raised in the linings ; but my brick bed being always of the same height, such difficulty can never happen.

The linings of my brick bed retain the heat longer than the linings of a dung bed do, and that because the flues are constantly full of steam ; but a dung bed having little or no vacuity for the retention of the steam, the steam of the linings of it is more immediately evaporated, and consequently the heat of the linings is sooner exhausted than the heat of the linings of the brick bed.

To illustrate this a little farther, it may be observed that there is a certain quality in dung which is the cause of its heating. While this quality, or any part of it, remains in the dung, it retains the heat in some degree ; but when that quality is totally exhausted, the heat in the dung ceases.

There is another method besides that of fermentation by which dung may be deprived of this quality ; and that is, by being exposed for some time to the sun and air in spreading it thinly on the ground. In that state the dung's heating quality will be evaporated,

porated, and were it to be thus exposed, it would also lose much of its vegetative powers. Hence it appears evident, that the steam, which undoubtedly contains the heating quality, being retained in the flues or cavities of the bed, and reverting to its first source, is the means of enabling the linings to keep the heat longer than they could do if there were no such cavities in the bed.

In the cultivation of the cucumber in the summer, under hand or bell glasses, the following method is generally practised: The seeds are sown some time about the middle of April in a cucumber or melon bed, and when they come up, they are potted out into small pots, two or three plants in each pot, and are kept properly watered, and stopped at the first or second joint. About the middle of May, a warm situation where the mould is very rich is pitched on, and a trench is dug out about two feet deep, three feet broad, and the length is proportioned according to the number of lights it is intended for. This trench is filled with good warm dung, and when the dung is come to its full heat, it is covered over with eight, ten, or twelve inches deep of rich mould. The glasses are then set upon it about three feet distant from each other, and when the mould gets warm under them, the plants are turned out of the pots with their balls whole, and plunged in the mould under the glasses, and a little water given them to settle the mould about their roots, the glasses set over them, and in fine days they are raised a little on one side to let the plants have the free air; and

as the weather gets warmer and warmer, air is given more plentifully to harden the plants, so that they may be able to bear the open air, and run from under the glasses.

When the plants begin to fill the glasses, they are trained out horizontally, and the glasses are set upon bricks or such-like, to bear them from the plants. After this the plants require nothing more but to be supplied with water when the summer showers are not sufficient, and to stop them when they run too thin of branches, and thin them of leaves or branches when they are likely to become over-crowded.

In warm summers and in warm situations, by this mode of management the plants will bear plentifully for about two months, provided they be not attacked by insects or weakened by diseases.

It is to be seen in the following journal, that on the 22d of October 1792 I sowed the seeds of the cucumber *, and ridged out the plants upon the 16th day of

* The cucumber plant may be kept on from year to year by cuttings. The method of sticking them is this: Take a shoot which is just ready for stopping, cut it off just below the joint behind the joint before which the shoot should have been stopped, then cut smooth the lower end of the shoot or cutting, and stick it into fine leaf or other rich mould about an inch deep, and give it plenty of heat, and shade it from the rays of the sun till it be fairly struck. By this method, as well as by that of laying, plants may readily be propagated.

Those who are desirous of having cucumbers early, had best sow the seeds about the 20th of October; they may be sown at any time of the year, but the spring and autumn are the best seasons. Cucumber plants may be made to bear fruit plentifully from

of November. The heat of the bed was then scarcely strong enough, nor did it become strong enough till about the 27th; the plants therefore made but little progress from the time of their being ridged out till the month of December.

On the 2d of January 1793 I renewed the south side lining, and on the 15th of the same month I renewed the north side lining. The renewal of the south side lining was done in a proper time, but the lining of the north side should have been deferred for a few days longer, for the weather proving cold

from about the middle of March till the middle of September, but from the middle of September till the middle of March their produce will be found small.

Although less dung is required for a brick bed than for a dung bed, yet it is of little use to try to raise early cucumbers without a sufficiency of dung. I have frequently heard complaints, and perhaps not without some degree of truth, by gentlemen's gardeners, especially in the country, that they were much perplexed for want of dung, &c. and that they could have none but when capacious stewards or directors of the husbandry thought fit. Such matters often breed quarrels between the gardener and the bailiff, and it is sometimes difficult for the gentleman to decide which is in fault. I shall only observe that no difficulty of that nature happens with me, because I have the direction both of the business of the farm as well as that of the garden, and I pay equal attention to both; for it gives me pleasure to see each prosper. The method therefore which I pursue with regard to the dung is this: I frequently take the littery dung from among the cow-cribs, and make linings for the melon and cucumber beds of it, and when it is rotten I have it carried to the fields for manure. I often prefer such, especially late in the spring and early in the summer, before horse-dung, because its heat is generally less violent and more durable.

and windy just after, the bed was for a few days rendered too cold, and when the lining came to its full strength of heat, the flues were for a few days rendered rather too warm, and consequently the plants received a small check. Again it is to be seen that on the 20th of November 1792 I covered the flues thinly with mould, and from that time until the 28th of February 1793, the flues remained thinly covered. The reason of keeping the flues thus covered with mould during that time was merely to save a little labour of watering; for while the mould continues moist upon the flues, vapours arise therefrom, and when mould on the flues is wetted, it retains the moisture longer than the tiles of the flues do. But it is the best way during the winter to keep the flues entirely bare of mould, and to water them as occasion may require.

Except the above-mentioned, all the rest of the management held forth in my journal will do, and will in future be a guide and directory to myself, so far as relates to the culture of the cucumber.

To those who may think proper to use my journal as a help in the management of early cucumbers, I would recommend that they should look to it about a week or ten days before, and as long after, the day of the month on which they want directions to go by. This is proper; because, for instance, the work which I had done about the bed on January 15th, 1793, may require to be done on the 8th of January in the year 1794, or perhaps it should be deferred till the 22d or thereabout, as the heat and
goodness

goodness of the dung, and other unforeseen circumstances, may determine.

After the cucumber bed is set to work, heat and sweet moisture are the two principal agents required for promoting the growth and vigour of the plants; therefore, if there be a heat kept in the linings strong enough to keep the heat in the centre of the pits of mould fluctuating between 80 and 90 degrees, cold water may be poured on the flues twice or thrice a week. There is no danger of creating damp or impure air in the frames by watering the flues; for the water is no sooner poured on them, than it runs down their sides, and passes clear off through the drains of the bed; consequently water being poured upon the flues, gives only a momentary check to the heat of the frames; for the flues being at all times full of hot steam, when the watering is finished, the heat quickly resumes its former vivacity, and raises a warm vapour in the frames, well adapted for promoting vegetation, and for increasing the growth and invigorating the plant in all its parts.

The mould round about the sides of the pits close against the inner sides of the flues, should be kept nearly on a level with the surface of the flues; and as it is the mould that joins to the flues which receives the first and greatest heat from the linings, it should continually be kept in a moist state; for if the mould against the flues be suffered to become dry and husky, air will be generated in the frames disagreeable to the plants.

During the winter and spring, in the mornings, just when the frames are uncovered, I never wish to find the heat of the air in the bed among the plants lower than 70 nor higher than 80 degrees; and during the same time I never wish the heat of the mould in the centre of the pits about six inches below the surface lower than 80 nor higher than 90 degrees. It appears, therefore, that, during the winter and spring months, I wish the medium heat of the air in the frames to be 75 degrees, and the medium heat of the mould to be 85 degrees. I speak now of artificial heat, for when the days are warm, and the sun shines, the heat of the air in the frames is often raised to a much higher degree. Reckoning the heat derived from the sun, the medium heat of the air in the frames may be about 80 degrees; and as the mould in the pits for two or three inches deep is more susceptible of heat and cold than at a greater depth, we may compute its medium heat to be nearly about the same degree as that of the air.

A bed may be built and set to work immediately; the heat of the linings will dry the lime of the joints of the bricks. The evaporation in the frames, from the moist lime of the joints of the brick-work, has no bad effect on the plants; but when a bed is set to work before it be dry and steady, great care must be taken not to injure the brick-work in filling up the pits.

EXPLANATION OF THE PLAN,

- a a* Pits for the plants. See the method explained in page 72.
 - b b* Two courses of brick-work : One of them laid under the tiles which cover the flues, and the other laid above them.
 - c c* The flues.
 - d d* Four-inch brick-work carried up full of holes or apertures.
 - e e* Brick on edge, carried up solid to the top of the flues.
 - f f* Four-inch brick-work carried up solid to the top of the flues.
 - g* Drain that carries off the water from the bed.
 - h h* Apertures or holes which are all round the bed, and through which the steam and heat of the linings enter the flues to warm the air in the frames.
 - i i* Small holes or drains ; these are at the bottom of each pit, and are to drain the water from the mould of the pits.
 - k k* South side of the frames on which the lights rest.
 - l* Light.
 - m m* Two courses of tiles which cover the flues, the ends of which extend to the outside of the brick-work.
 - n n* Foundation of the bed, which is under ground.
 - o* End of the frames.
-

I have given the plan of a bed for six lights only, but a bed may be extended to any length or size required by the same model.

MANAGEMENT

OF THE

CUCUMBER PLANTS.

[S. *Th.* stands for Surface Thermometer. P. *Th.* for Plunged Thermometer. *Ther.* for Thermometer in the open air.—The Surface Thermometer stood nearly upright among the plants, and partly exposed to the rays of the sun.]

Wednesday, October 17, 1792.

Hours.	S. Th.	P. Th.	Ther.	Wind.
6	—	—	42	S. W. Clear, and a brisk wind.
8	—	—	44	S. W. Ditto.
10	—	—	48	S. W. Sunshine.
12	—	—	53	S. W. Windy, and some drops
2	—	—	54	S. W. Ditto. [of rain fall.
5	—	—	49	S. W. Cloudy, windy.
9	—	—	46	S. W. Ditto.

To-day I had a bed made up of hot dung for a two light frame; it was made about four feet and a half high, and the box and lights were set upon it.

Thursday, October 18, 1792.

Hours.	S. Th.	P. Th.	Ther.	Wind.
6	—	—	40	S. W. Clear and a brisk gale of
8	—	—	43	S. W. Ditto. [wind.
10	—	—	49	S. W. Clouds begin to arise.
12	—	—	51	S. W. Cloudy, and a brisk wind.
2	—	—	50	S. W. A light shower of rain.
4	—	—	48	S. W. Cloudy.
5	—	—	44	S. W. Clear, and but little wind.
9	—	—	38	S. W. Ditto.

The lights of the cucumber bed were kept close shut down day and night.

Friday,

Friday, October 19, 1792.

Hours.	S.	Th.	P.	Th.	Ther.	Wind.
6	—	—	—	—	32	S. W. Clear, frosty.
8	—	—	—	—	39	S. W. Ditto.
11	—	—	—	—	45	S. W. The sky is overcast.
12	—	—	—	—	50	S. W. Sunshine.
1	—	—	—	—	50	S. W. The sky is overcast.
2	—	—	—	—	49	S. W. The sun appears faintly.
4	—	—	—	—	44	S. W. It rains gently.
9	—	—	—	—	45	S. W. Cloudy.

The heat of the cucumber bed began to rise; a little air was given to it to let the steam pass off.

Saturday, October 20, 1792.

Hours.	S.	Th.	P.	Th.	Ther.	Wind.
6	—	—	—	—	50	S. W. Cloudy, and a brisk wind.
10	—	—	—	—	53	S. Gloomy, the clouds look
12	—	—	—	—	55	S. Cloudy. [rainy,
2	—	—	—	—	58	S. It rains a little.
4	—	—	—	—	56	S. Ditto.
8	—	—	—	—	52	S. It has rained since 4 o'clock,

A strong heat is got up in the cucumber bed; air was continued at it day and night.

Sunday, October 21, 1792.

Hours.	S.	Th.	P.	Th.	Ther.	Wind.
6	—	—	—	—	49	S. E. Clear, the sky red before
10	—	—	—	—	55	S. It rains. [sun-rise,
12	—	—	—	—	55	S. It has rained heavily since
2	—	—	—	—	56	S. Fair, gloomy. [10 o'clock.
5	—	—	—	—	54	S. Light clouds, nearly calm,
9	—	—	—	—	49	S. Ditto.

Air was continued at the cucumber frame day and night to let the steam pass off.

1

Monday,

Monday, October 22, 1792.

Hours.	S.	Th.	P.	Th.	Ther.	Wind.
6	—	—	—	—	49	S. W. Flying clouds.
10	—	—	—	—	57	S. W. Windy, scuds of rain.
11	—	—	—	—	59	S. W. Scattered clouds.
2	—	—	—	—	58	S. W. Ditto.
5	—	—	—	—	55	S. W. Showers of rain.
8	—	—	—	—	48	S. W. Clear, and a brisk wind.

In the afternoon I sowed cucumber seed in leaf mould in pans about three inches deep, covered it about half an inch thick, and set them on the surface of the bed. I then set a thermometer in the frame, and at 4 o'clock the mercury stood at 94. The lights were shut close down in the evening for the night.

Tuesday, October 23, 1792.

Hours.	S.	Th.	P.	Th.	Ther.	Wind.
6	83	—	—	—	32	N. W. Clear and frosty.
10	80	—	—	—	39	N. Cloudy.
12	81	—	—	—	46	N. Scattered clouds.
3	79	—	—	—	44	N. Cloudy.
5	77	—	—	—	40	N. Clouds in the horizon.
9	—	—	—	—	37	N. Clear.

The cucumber frame got air at 6 o'clock in the morning, which was continued day and night.

Wednesday,

Wednesday, October 24, 1792.

Hours.	S.	Th.	P.	Th.	Ther.	Wind.
6	82	—	—	—	42	S. W. Clear, and a brisk gale of
10	79	—	—	—	53	S. W. Scattered clouds. [wind.
12	79	—	—	—	55	S. W. Cloudy.
2	81	—	—	—	53	S. W. The sun shines faintly.
4	80	—	—	—	48	S. W. Thin clouds all over the
5	78	—	—	—	46	S. W. Ditto. [sky.
9	—	—	—	—	42	S. W. Some clouds.

The plants begin to appear, the frame was covered up in the evening with single mats, and a little air was left at each light all night.

Thursday, October 25, 1792.

Hours.	S.	Th.	P.	Th.	Ther.	Wind.
6	76	—	—	—	37	N. E. Foggy dull morning.
10	75	—	—	—	47	N. E. The sun glimpses.
12	76	—	—	—	49	N. E. Scattered great clouds.
2	71	—	—	—	48	N. E. Cloudy.
5	66	—	—	—	44	N. E. Ditto.
9	—	—	—	—	43	N. E. Ditto.

The frame was uncovered at six o'clock in the morning, and covered up in the evening with single mats; the surface of the bed was loosened with a dung-fork four or five inches deep; air was continued day and night.

Friday,

Friday, October 26, 1792.

Hours.	S.	Th.	P.	Th.	Ther.	Wind.
6	70	—	—	—	42	N. E. Cloudy, and a brisk wind.
8	68	—	—	—	42	N. E. Ditto.
10	69	—	—	—	43	N. E. Some drops of rain fall.
12	71	—	—	—	44	N. E. Ditto.
2	75	—	—	—	44	N. E. Showery.
4	73	—	—	—	41	N. E. Gloomy.
9	—	—	—	—	41	N. E. Ditto.

The frame was uncovered in the morning, and covered in the evening with fingle mats; air was continued day and night.

Saturday, October 27, 1792.

Hours.	S.	Th.	P.	Th.	Ther.	Wind.
6	79	—	—	—	43	E. Cloudy, and a brisk wind.
8	75	—	—	—	48	S. E. Ditto.
10	82	—	—	—	53	S. E. Cloudy, nearly calm.
12	83	—	—	—	57	S. E. Scattered small clouds.
2	82	—	—	—	58	S. Ditto.
4	78	—	—	—	52	S. Ditto.
5	76	—	—	—	49	S. Ditto.
9	—	—	—	—	47	S. Light clouds.

The frames were uncovered about 6 o'clock in the morning, and covered up in the evening with fingle mats; air was continued day and night; the feed leaves of the plants are fairly expanded.

Sunday,

Sunday, October 28, 1792.

Hours.	S.	Th.	P.	Th.	Ther.	Wind.
6	76	—	—	—	50	S. Cloudy, moist; there had been rain in the night.
9	77	—	—	—	55	S. Cloudy, nearly calm.
10	78	—	—	—	58	S. Hazy.
12	80	—	—	—	60	S. Sunshine.
2	82	—	—	—	59	S. Clouds here and there.
4	78	—	—	—	57	S. W. Ditto.
9	—	—	—	—	50	S. W. Ditto.

The frames were uncovered about 6 o'clock in the morning, and covered up in the evening with single mats; air was continued day and night.

Monday, October 29, 1792.

Hours.	S.	Th.	P.	Th.	Ther.	Wind.
6	—	—	—	—	50	S. W. It rains lightly.
7	75	—	—	—	51	S. W. Fair, cloudy.
10	76	—	—	—	56	S. W. Ditto.
12	80	—	—	—	57	S. W. Ditto.
2	79	—	—	—	58	S. W. Sunshine now and then.
4	77	—	—	—	57	S. W. Ditto.
5	75	—	—	—	56	S. W. Ditto.
9	—	—	—	—	48	S. W. Clear.

The frames were uncovered at 7 o'clock in the morning, and covered up in the evening with single mats; air was continued day and night.

Tuesday,

Tuesday, October 30, 1792.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	72	—	44	S.W. Thin clouds cover the
10	79	—	54	S.W. It rains lightly. [fky.
12	78	—	55	S.W. Cloudy.
3	76	—	54	S.W. Ditto.
5	72	—	52	S.W. Light showers.
9	—	—	47	S.W. Cloudy.

The frames were uncovered about 6 o'clock in the morning, and covered in the evening with single mats; air was continued day and night. In the afternoon I potted out the plants in small pots, three plants in each; the surface of the bed was then loofened, and the pots of plants set on its surface.

Wednesday, October 31, 1792.

Hours.	S.Th.	P.Th.	Ther.	Wind.
7	82	—	50	S.W. It rains.
10	83	—	53	S.W. Fair, cloudy.
11	86	—	53	S.W. Ditto.
12	88	—	54	S.W. Sunshine.
1	89	—	54	S.W. Ditto.
3	84	—	54	S.W. Scattered clouds.
5	78	—	48	S.W. Ditto.
8	—	—	44	S.W. Clear, and a brisk wind.

The frames were uncovered in the morning, and covered up in the evening with single mats; air was continued day and night.

G

Thursday,

Thursday, November 1, 1792.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	71	—	44	S.W. Light clouds, which are
10	80	—	50	S.W. Cloudy. [red in the east.
1	74	—	51	S.W. Gloomy.
2	73	—	51	S.W. Ditto. [since 3 o'clock.
4	69	—	49	S.W. Windy; it has rained
5	68	—	49	S.W. It continues to rain.
9	—	—	44	S.W. Windy, and a small rain.

The frame was uncovered at 7 o'clock in the morning, and covered up in the evening with double mats. The surface of the bed was loosened, and water poured into it; the plants were watered in the forenoon with water 75 degrees warm.

Friday, November 2, 1792.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	70	—	37	S.W. Clear, and a brisk gale of wind.
9	75	—	42	S.W. Sunshine, nearly calm.
11	85	114	47	S.W. Ditto.
12	91	117	49	S.W. Ditto.
2	91	118	48	S.W. Ditto.
4	80	119	45	S.W. Clouds in the horizon.
9	—	—	43	S.W. Clouds here and there.

The frames were uncovered in the morning, and covered up in the evening with double mats. At 10 o'clock in the morning I plunged a thermometer in the surface of the bed among the pots of plants, and sunk its bulb about six inches deep in the dung. Air was continued at the plants day and night.

Saturday,

Saturday, November 3, 1792.

Hours.	S.Th.	P.Th.	Ther.	Wind.
7	78	122	46	S.W. Light clouds cover the sky.
10	86	122	52	S.W. Clear, and a brisk gale of
12	85	123	54	S.W. Sunshine. [wind.
2	82	124	55	S.W. Ditto.
4	80	124	52	S.W. Clear, and nearly calm.
8	—	—	51	S.W. Cloudy.

The frame was uncovered in the morning about 7 o'clock, and covered up in the evening with double mats. The plants were watered in the morning with water about 80 degrees warm.

Sunday, November 4, 1792.

Hours.	S.Th.	P.Th.	Ther.	Wind.
7	74	121	40	S. E. Clear, and nearly calm;
10	82	122	49	S. Sunshine.
12	84	123	53	S. Ditto.
2	84	124	54	S. Ditto.
3	78	124	53	S. W. Ditto.
5	76	124	51	S. W. Clouds here and there.
8	—	—	44	S. W. Light clouds.

The frame was uncovered about 7 o'clock in the morning, and covered up in the evening with double mats. Air was continued day and night. The plants have their first rough leaves fairly expanded.

Monday, November 5, 1792.

Hours.	S.Th.	P.Th.	Ther.	Wind.
7	65	118	32	N. E. Thick fog, white frost.
10	76	118	38	N. E. The sun appears through
11	80	119	43	N. E. Sunshine. [the fog.
12	92	121	48	N. E. Ditto. [east.
2	80	121	47	N. E. Fog comes from the north-
4	79	121	42	N. E. Ditto.
9	—	—	37	N. E. Ditto.

The frame was uncovered about 8 o'clock in the morning, and covered up in the evening with mats. Air was continued day and night.

Tuesday, November 6, 1792.

Hours.	S.Th.	P.Th.	Ther.	Wind.
7	62	115	29	S.W. White frost, and a thick fog, which has a disagreeable smell.
10	70	115	37	W. Foggy, nearly calm.
12	78	117	46	W. Hazy.
2	76	118	46	N. Very thick fog.
4	72	119	44	N. E. Ditto.
6	—	—	44	N. E. Ditto.
8	—	—	45	N. E. The fog is more thin.

The frame was uncovered about 8 o'clock in the morning, and covered up in the evening with double mats. In the forenoon the surface of the bed was loosened seven or eight inches deep, and made level; the pots of plants were then set on the surface of the dung in hollows made with the hand, so that the roots of the plants might receive a greater degree of heat than that of the air in the frame, and yet be prevented from an over-heat. Air was continued night and day.

Wednesday,

Wednesday, November 7, 1792.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	69	122	43	S.W. High thick clouds.
10.	69	122	46	S.W. Ditto
12	67	122	48	S.W. Gloomy.
2	71	122	48	S.W. Ditto.
4	68	122	48	S.W. Ditto.
9	—	—	46	S.W. Cloudy.

The frames were uncovered about 8 o'clock in the morning, and covered up in the evening with double mats. Air was continued day and night. At noon the plants were watered with water 76 degrees warm.

Thursday, November 8, 1792.

Hours.	S.Th.	P.Th.	Ther.	Wind.
7	67	120	46	S.W. Cloudy, calm.
8	66	120	47	S.W. Ditto.
10	68	119	49	S.W. Ditto.
12	75	119	53	S.W. Gloomy.
2	71	120	53	S.W. Ditto.
4	65	120	49	S.W. Ditto.
9	—	—	44	S.W. Cloudy.

The frame was uncovered a little before 8 in the morning, and covered up in the evening with double mats. Air was continued day and night.

Friday, November 9, 1792.

Hours.	S.Th.	P.Th.	Ther.	Wind.
7	80	121	41	S. Gloomy.
9	76	121	49	S. Cloudy, nearly calm.
10	75	121	53	S. Ditto.
12	76	121	53	S. Ditto.
2	75	121	52	S. Ditto.
4	72	121	50	S. Cloudy, wind brisk.
8	—	—	42	S.W. Clear, nearly calm.

The frames were uncovered at 8 o'clock in the morning, and covered up in the evening with double mats. Air was continued day and night.

Saturday, November 10, 1792.

Hours.	S.Th.	P.Th.	Ther.	Wind.
7	70	119	47	S.W. Cloudy, and a brisk air
9	70	119	41	S.W. Ditto. [of wind.
11	71	119	53	S.W. Light clouds.
1	74	119	54	S.W. The sun shines faintly.
2	70	119	53	S.W. Cloudy.
4	67	118	50	S.W. Gloomy.
9	—	—	47	S.W. Dark.

The frames were uncovered about 8 o'clock in the morning, and covered up in the evening with double mats. Air was continued day and night.

Sunday,

Sunday, November 11, 1792.

Hours.	S.Th.	P.Th.	Ther.	Wind.
7	67	115	47	S.W. Hazy thick atmosphere.
8	66	115	48	S.W. Ditto.
10	71	115	49	S.W. Gloomy, some drops of
1	73	115	50	S.W. Gloomy. [rain fall.
2	71	116	49	S.W. Ditto.
4	70	116	47	S.W. Ditto.
9	—	—	43	S.W. Light clouds.

The frame was uncovered about 7 o'clock in the morning, and covered up in the evening with double mats. Air was continued day and night.

Monday, November 12, 1792.

Hours.	S.Th.	P.Th.	Ther.	Wind.
7	77	116	35	S. E. The sky is covered with light streaky clouds, which are red a good way up the horizon.
9	74	116	39	S. E. Sunshine.
10	81	116	44	S. E. Ditto.
12	85	116	48	S. E. Ditto.
2	74	116	48	S. E. Clouds in the horizon.
7	—	—	41	S. E. High wind, and some
9	—	—	42	S. E. Ditto. [clouds.

The frame was uncovered about 7 o'clock in the morning, and covered up in the evening with double mats. Air was continued day and night. The second rough leaves of the plants are fairly expanded.

Tuesday, November 13, 1792.

Hours. S.Th. P.Th. Ther. Wind.

6	—	—	47	S. E. High wind, and scuds of rain.
7	68	110	48	S. E. There is a rainbow in the north-west.
10	70	110	50	S. E. Flying clouds, windy.
12	74	110	51	S. Cloudy, and nearly calm.
4	68	110	50	S. Clouds here and there.
7	—	—	44	S.W. Clear, and nearly calm.
8	—	—	45	S.W. A heavy rain.

The frame was uncovered about 7 o'clock in the morning, and covered up in the evening with double mats. Air was continued day and night. To-day old mats were hung round about the sides of the bed to keep it warm.

Having taken the last year's earth from off the bed, and out of the pits, about four inches below the surface of the flues, I had the flues brushed over with thick grout made of lime and water, to make the joints of the flues close, to prevent the steam of the linings from getting into the frames. I then had the pits filled up on a level with the flues with fresh leaf earth, and pressed it gently down to keep it from sinking afterwards. I then made a hill of earth in the middle of each pit, raising each hill about eight or nine inches above the level of the flues; those hills are designed to set the plants in. Having thus done, a lining of dung was made all round the bed, and it was made three feet wide at the foundation, and tapered up to about 28 inches at the top, and it

was

was raised near four feet high, and was made of strong stinking wet dung which had lain for some time in a dung-hole.

Wednesday, November 14, 1792.

Hours.	S.Th.	P.Th.	Ther.	Wind.
7	70	111	44	S.W. High wind, and it rains.
9	69	111	43	S.W. Cloudy and windy.
10	73	111	45	S.W. Scattered clouds.
11	75	111	47	S.W. Scattered flying clouds,
1	70	111	50	S.W. Scuds of rain. [windy.
2	71	111	50	S.W. Windy.
4	64	110	46	S.W. The wind is very high.
8	—	—	46	S.W. Clear and windy.

The frame was uncovered about 8 o'clock in the morning, and covered up in the evening, with about three inches thick of hay and mats. At 1 o'clock I watered the plants with water 78 degrees warm.

Thursday, November 15, 1792.

Hours.	S.Th.	P.Th.	Ther.	Wind.
7	70	105	43	S.W. Cloudy, and a brisk gale of wind.
10	68	105	47	S.W. Flying clouds, windy.
12	68	105	48	S.W. Sunshine, windy.
2	69	105	47	S.W. Ditto.
4	63	104	41	W. Clear, and a brisk gale of wind.

The frame was uncovered about 8 o'clock in the morning, and covered up in the evening with hay and mats. Air was continued day and night.

Friday,

Friday, November 16, 1792.

Hours.	S.Th.	P.Th.	Ther.	Wind.
7	65	103	35	W. Strong gale of wind, and streaky clouds, which are reddish in colour.
10	69	103	40	W. Sunshine; windy.
12	68	65	43	W. Ditto.
4	64	65	41	W. Windy, and flying clouds.

Between 10 and 11 o'clock I took nine pots of plants out of the seedling frame, and carried them to the fruiting frames, which were set a-going on Tuesday last, and I plunged one pot of plants in each hill. I also removed the thermometers from the seedling frame to the fruiting ones, and in the middle hill of the middle frame close to the pot of plants I sunk the bulb of one of the thermometers about six inches deep in the earth of the hill, and the other thermometer I set at the foot of the hill nearly upright, and rested its bulb on the surface of the earth.

The frames were covered up in the evening with single mats, and a little air left at each light all night.

Saturday, November 17, 1792.

Hours.	S.Th.	P.Th.	Ther.	Wind.
7	62	64	25	W. Clear, and a sharp frost.
10	65	64	28	W. Sunshine.
1	79	72	36	W. Ditto.
2	78	72	35	S.W. Ditto.
4	67	71	31	S.W. Clear and calm.

The frames were uncovered about 8 o'clock in the morning, and covered up in the evening with single mats.

mats. In the afternoon I turned the plants out of the pots with their balls whole, and I put three plants in each hill, and covered the balls with the earth about an inch thick up the stems of the plants. There was a great steam rising out of the linings about the frames all the day.

Sunday, November 18, 1792.

Hours.	S.Th.	P.Th.	Ther.	Wind.
7	65	68	30	S.W. Thin clouds all over the
9	66	68	34	S.W. Ditto. [sky,
10	68	68	40	S.W. Ditto.
1	72	70	43	S.W. Cloudy and nearly calm.
2	70	70	43	S.W. Ditto.
5	61	69	40	S.W. Cloudy, and a brisk wind.

The frames were uncovered about 8 o'clock in the morning, and covered up in the evening with single mats. Air was continued night and day.

Monday, November 19, 1792.

Hours.	S.Th.	P.Th.	Ther.	Wind.
7	72	72	46	S.W. Cloudy and windy.
10	68	71	45	S.W. The sun shines faintly.
12	65	70	48	S.W. Sunshine.
1	66	69	48	S.W. Ditto.
2	67	69	47	W. A shower of rain.
4	65	69	44	W. Cloudy and windy.

The frames were uncovered about 8 o'clock in the morning, and covered up in the evening with single mats. Air was continued day and night.

Tuesday,

Tuesday, November 20, 1792.

Hours.	S.Th.	P.Th.	Ther.	Wind.
7	66	68	28	S.W. Thin clouds; the sky is red before the sun.
10	66	68	33	S.W. Thin clouds.
1	75	71	39	S.W. The sun shines faintly.
2	72	72	38	S.W. Cloudy, and nearly calm.
4	67	71	36	S.W. Ditto,
6	—	—	34	S.W. Thin clouds.

The frames were uncovered about 8 o'clock in the morning, and covered up about 4 o'clock in the evening with fingle mats.

Wednesday, November 21, 1792.

Hours.	S.Th.	P.Th.	Ther.	Wind.
7	64	67	47	S.W. Cloudy, and a brisk gale
10	65	67	50	S.W. Ditto. [of wind,
12	66	67	51	S.W. Cloudy and windy.
1	63	67	52	S.W. Ditto.
2	63	67	51	S.W. Ditto.
5	—	—	49	S.W. Windy, and it rains.

The frames were uncovered about 7 o'clock in the morning, and covered up in the evening with fingle mats.

Thursday, November 22, 1792.

Hours.	S.Th.	P.Th.	Ther.	Wind.
7	59	65	36	S.W. Cloudy and windy.
10	62	65	40	S.W. Ditto.
11	72	68	42	S.W. Sunshine.
1	74	68	43	S.W. Ditto.
2	67	69	40	S.W. Cloudy and windy.
3	65	69	37	S.W. A heavy shower of hail, & high gust of wind.

The frames were uncovered at 8 o'clock in the morning,

morning, and covered up in the evening with about two inches thick of hay and mats. Air was given all day, and a little left at each light all night. I had all the flues covered about an inch thick with leaf earth, and a little laid all round against the insides of the frames.

Friday, November 23, 1792.

Hours.	S.Th.	P.Th.	Ther.	Wind.
7	74	75	34	N.W. Thin clouds.
9	67	74	35	N.W. Clear in the west.
10	69	73	37	N.W. Cloudy, and a brisk wind.
12	69	72	41	N.W. Cloudy and windy.
3	64	72	41	N.W. Small shower of rain.
5	—	—	41	N.W. Ditto.
7	—	—	41	N. Showery.

The frames were uncovered at 7 o'clock in the morning, and covered up in the evening with about three inches thick of hay and mats. There not being a good heat in the linings, to-day I had them turned, and shaken well, and laid up light, so that a better heat might arise in them. I found the dung wet, and a very bad smell in it.

Saturday, November 24, 1792.

Hours.	S.Th.	P.Th.	Ther.	Wind.
7	70	74	32	N.E. Some clouds, near calm.
9	69	74	36	N.E. Cloudy.
10	67	73	38	N.E. Ditto.
1	65	72	41	N.E. Ditto.
3	63	71	40	N.E. Ditto, and a cold wind.
4	61	71	40	N.E. Ditto.
9	—	—	39	N.E. Thin clouds.

The frames were uncovered about 8 o'clock in the morning,

morning, and covered up in the evening with hay and mats; a little air was given in the day-time, but the lights were shut close down in the evening for the night.

Sunday, November 25, 1792.

Hours.	S.Th.	P.Th.	Ther.	Wind.
7	—	—	39	N. E. Thin clouds, and a brisk
8	72	75	39	N. E. Ditto [gale of wind.
10	68	74	42	N. E. Ditto.
3	66	73	42	N. E. Ditto.
4	65	73	41	N. E. Ditto.
7	—	—	42	N. E. Ditto.

The frames were uncovered about 8 o'clock in the morning, and covered up in the evening with about two inches thick of hay and mats; but little air was given in the day-time, and the lights were shut close down all night.

Monday, November 26, 1792.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	—	—	35	N. E. Cloudy, and a brisk wind.
8	75	78	37	N. E. Gloomy.
10	69	76	38	N. E. Ditto.
12	66	75	39	N. E. Ditto.
2	66	75	39	N. E. Ditto.
4	65	74	40	N. E. Some drops of rain fall.

The frames were uncovered about 8 o'clock in the morning, and covered in the evening with about three inches thick of hay and mats. The linings, being sunk, were raised with fresh long dung.

Tuesday,

Tuesday, November 27, 1792.

Hours.	S.Th.	P.Th.	Ther.	Wind.
7	82	81	39	N. E. Cloudy, gloomy.
10	71	78	40	N. E. Ditto.
12	71	78	41	N. E. Ditto.
2	70	77	42	N. E. Ditto.
4	67	77	40	N. E. Ditto.

The frames were uncovered about 8 o'clock in the morning, and covered up in the evening with hay and mats. About 11 o'clock I gave the plants a little water 75 degrees warm.

Wednesday, November 28, 1792.

Hours.	S.Th.	P.Th.	Ther.	Wind.
7	82	82	35	E. Cloudy, and near calm.
8	82	82	35	E. Ditto.
10	72	81	36	E. Ditto.
12	70	79	38	E. Ditto.
2	67	77	37	E. Some drops of rain fall.
4	66	76	36	E. Hazy.
6	—	—	34	E. A small rain.

The frames were uncovered about 8 o'clock in the morning, and covered up in the evening with about four inches thick of hay and mats. To-day there was a great heat in the linings, and a great steam arising out of them. I had several tubs of water poured on them, and most was given to those parts where the heat was greatest. A little air was given in the day-time, but the lights were shut close all night.

Thursday,

Thursday, November 29, 1792.

Hours.	S.Th.	P.Th.	Ther.	Wind.
8	80	83	29	E. Clear, and near calm.
9	77	82	30	E. Ditto.
10	80	82	33	E. Sunshine.
11	84	83	35	E. Ditto.
12	87	84	38	E. Ditto.
1	90	85	39	E. Ditto.
3	82	85	36	E. Ditto.
4	75	85	32	E. Clear and calm.

The frames were uncovered about 8 o'clock in the morning, and covered up in the evening with hay and mats; air was given in the day-time, and a little left at each light all night.

Friday, November 30, 1792.

Hours.	S.Th.	P.Th.	Ther.	Wind.
7	—	—	35	S. E. Foggy and near calm.
8	82	85	35	S. E. Ditto.
10	69	84	35	S. E. Ditto.
12	68	80	36	S. E. Ditto.
2	68	80	35	S. E. Ditto.
4	66	80	35	S. E. Ditto.
9	—	—	29	S. E. Foggy and dark.

The frames were uncovered about 8 o'clock in the morning, and covered at 4 in the evening with hay and mats. The linings, being funk, were raised; air was given in the day-time, and a little left at each light all night.

Saturday,

Saturday, December 1, 1792.

Hours.	S.Th.	P.Th.	Ther.	Wind.
8	68	77	32	S. E. Cloudy, and a brisk wind.
10	66	77	34	S. E. Ditto.
12	64	76	32	S. E. Ditto.
2	64	76	32	S. E. Ditto.
4	62	77	31	S. E. Gloomy.
6	—	—	30	S. E. Cloudy.

The frames were uncovered between 8 and 9 o'clock in the morning, and covered up about 4 in the evening with about three inches thick of hay and mats. Air was continued day and night.

Sunday, December 2, 1792.

Hours.	S.Th.	P.Th.	Ther.	Wind.
8	70	80	34	N. E. Cloudy, and a brisk gale
10	66	80	35	N. E. Ditto. [of wind.
12	65	81	36	N. E. Ditto.
2	64	81	36	N. E. Ditto.
4	63	81	35	N. E. Ditto.

The frames were uncovered about 8 o'clock in the morning, and covered up in the evening with hay and mats. The plunged thermometer is now sunk in the pit about four inches from the north side flue, and its bulb is about six inches below the surface of the earth.

H

Monday,

Monday, December 3, 1792.

Hours.	S.Th.	P.Th.	Ther.	Wind.
7	—	—	33	N. E. Thick foggy clouds, near-
8	70	84	34	N. E. Ditto. [ly calm.
10	70	84	35	W. Ditto.
12	64	83	34	W. Cloudy, and a brisk wind.
2	60	82	32	W. Ditto.
4	59	82	30	W. Ditto.
6	—	—	28	W. Ditto.

The frames were uncovered about 8 o'clock in the morning, and covered up in the evening with hay and mats. Air was given in the day-time, but the lights were shut close down all night.

Tuesday, December 4, 1792.

Hours.	S.Th.	P.Th.	Ther.	Wind.
7	76	85	35	S.W. Foggy, and nearly calm.
9	71	85	36	S.W. Ditto.
10	70	85	37	S.W. Cloudy, and a brisk wind.
12	67	85	42	S.W. Ditto.
3	63	84	42	S.W. Ditto.
4	60	84	44	S.W. It rains gently. [high.
8	—	—	45	S.W. It rains, and the wind is

The frames were uncovered about 8 o'clock in the morning, and covered up in the evening with about four inches thick of hay and mats.

Wednesday,

Wednesday, December 5, 1792.

Hours.	S.Th.	P.Th.	Ther.	Wind.
7	—	—	50	W. Cloudy, windy; there had been rain in the night.
8	72	84	50	W. Cloudy and windy.
10	66	84	50	W. Ditto.
12	65	84	51	W. Ditto.
2	63	83	52	W. Ditto.
4	64	83	52	W. Ditto.

The frames were uncovered about 8 o'clock in the morning, and covered up in the evening with hay and mats. Air was given in the day-time, but the lights were shut close down all night.

Thursday, December 6, 1792.

Hours.	S.Th.	P.Th.	Ther.	Wind.
7	—	—	42	S. E. Cloudy, and but little wind.
8	83	89	43	S. W. Ditto.
10	69	87	46	S. W. Cloudy and windy.
12	67	86	48	S. W. Scattered clouds, windy.
2	63	86	48	S. W. Cloudy and windy.
4	65	85	47	S. W. Ditto.
8	—	—	44	S. W. Clear and windy.

The frames were uncovered between 8 and 9 o'clock in the morning, and covered up about 4 in the evening with about three inches thick of hay and mats. The linings, being sunk, were raised with fresh dung. Air was admitted all day, and a little left at each light all night.

H 2

Friday,

Friday, December 7, 1792.

Hours.	S.Th.	P.Th.	Ther.	Wind.
7	—	—	35	N.W. Windy, and some clouds.
8	70	86	36	N.W. Ditto.
12	74	86	37	N.W. Sunshine.
2	69	86	36	N.W. Ditto.
4	64	86	31	N.W. Clear, and a brisk wind.
7	—	—	27	N.W. Clear, and nearly calm.

The frames were uncovered between 8 and 9 o'clock in the morning, and covered up about 4 o'clock in the evening with hay and mats. The linings were examined, and put close to the sides of the frames. The lights were shut close down for about two hours in the middle of the day. A little air was left at each light all night. To-day I went over the plants and stopped them, and with my hand I stirred the mould on the flues, and also about the foot of the hills all round about.

Saturday, December 8, 1792.

Hours.	S.Th.	P.Th.	Ther.	Wind.
5	—	—	27	W. Clear, calm; a little hail lies on the earth, which had fallen in the night.
7	—	—	26	W. Ditto.
8	76	88	27	W. Clear, and nearly calm.
9	72	88	28	W. Ditto.
10	74	88	30	W. Sunshine.
12	75	88	35	S.W. Ditto.
3	76	88	34	S.W. Ditto.
4	69	88	32	S.W. Streaky clouds.
9	—	—	35	S.W. Ditto.

The frames were uncovered about 8 o'clock in the morning,

morning, and covered up about 4 in the evening with about two inches thick of hay and mats. Air was given all day, and a little left at each light during the night.

Sunday, December 9, 1792.

Hours.	S.Th.	P.Th.	Ther.	Wind.
7	—	—	39	W. Cloudy, and a high wind.
9	72	89	43	W. Ditto.
10	70	89	45	W. Ditto.
11	67	88	46	W. Ditto.
1	64	87	47	W. Ditto.
3	67	87	47	W. Some drops of rain fall.
4	—	—	47	W. A small drifting rain.

The frames were uncovered at 9 o'clock in the morning, and covered up in the evening with hay and mats. The lights were shut close down about 1 o'clock, and were let remain so all night.

Monday, December 10, 1792.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	—	—	49	W. Windy and cloudy.
8	80	93	50	W. Ditto.
10	70	92	51	W. Ditto.
12	67	91	52	W. High wind, and light clouds.
2	65	90	52	W. Ditto.
4	63	90	51	W. Ditto.
8	—	—	49	W. Clear and windy.

The frames were uncovered about 8 o'clock in the morning, and covered up in the evening with about three inches thick of hay and mats. To-day I went over the plants, and picked up the weeds that were growing among them, and stirred with my hand

the earth on the flues. The linings were examined, and put clofe to the fides of the frames.

Tuesday, December 11, 1792.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	—	—	41	W. Clear, and a strong gale of wind.
7	—	—	40	W. The wind is fallen a little.
8	72	91	41	W. Streaky clouds.
10	69	91	43	W. The fun glimmers.
12	68	90	44	W. Cloudy and windy.
2	63	89	42	W. The sun shines faintly.
4	62	88	40	W. Clear and windy.

The frames were uncovered about 8 o'clock in the morning, and covered up in the evening with about four inches thick of hay and mats. A little air was continued at each light day and night.

Wednesday, December 12, 1792.

Hours.	S.Th.	P.Th.	Ther.	Wind.
7	—	—	31	W. Streaky clouds, and but little wind.
8	78	92	32	W. The sun appears faintly.
10	69	91	35	W. Ditto.
12	68	90	36	N.W. Cloudy, and a cold wind.
3	60	88	36	N.W. Ditto.
4	62	88	36	N.W. Ditto.
7	—	—	36	N.W. It rains.

The frames were uncovered about 8 o'clock in the morning, and covered up in the evening with hay and mats. About noon I got water warmed to about 80 degrees, and therewith I watered those parts of the flues that appeared dry, and poured some of it against

against the sides of the frames all round. I then laid a little more earth on the flues close against the sides of the frames.

Thursday, December 13, 1792.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	—	—	39	N.W. It rains gently.
9	74	90	36	N. E. Ditto.
10	68	89	36	N. E. Ditto.
12	68	88	37	N. E. A drizzling rain.
2	67	88	37	N. E. Ditto.
4	65	87	36	N. E. Ditto.

The frames were uncovered a little before 9 o'clock in the morning, and covered up in the evening with hay and mats. The linings, being funk, were raised. Air was given day and night.

Friday, December 14, 1792.

Hours.	S.Th.	P.Th.	Ther.	Wind.
7	—	—	36	N.W. Cloudy and windy.
9	77	90	40	N.W. Ditto.
10	70	90	44	N.W. Ditto.
12	74	90	49	N.W. Ditto.
2	72	90	48	N.W. Ditto.
4	70	89	47	N.W. Ditto.
7	—	—	44	N.W. Ditto.

The frames were uncovered about 9 o'clock in the morning, and covered up about 4 in the evening with about three inches thick of hay and mats. In the forenoon I went over the plants, and stopped them, and picked the weeds out of the mould; but little air was given in the day-time, and in the evening the lights were shut close down for the night.

H 4

Satur-

Saturday, December 15, 1792.

Hours.	S.Th.	P.Th.	Ther.	Wind.
7	—	—	41	W. Cloudy, and a brisk gale of
8	85	94	42	W. Ditto. [wind.
10	73	92	44	W. The sun glimpses.
11	71	90	46	W. Cloudy.
1	73	89	48	W. Ditto.
3	69	89	47	W. Ditto.
4	68	89	47	W. Ditto.

The frames were uncovered about 8 o'clock in the morning, and covered up in the evening with hay and mats. Air was given all day, and the lights were shut down in the evening for the night.

Sunday, December 16, 1792.

Hours.	S.Th.	P.Th.	Ther.	Wind.
7	—	—	38	S.E. Thick clouds, near calm.
8	88	93	38	E. Ditto.
10	74	94	40	E. Ditto.
11	73	94	41	E. Gloomy.
1	72	93	43	E. Ditto.
3	70	92	42	E. Ditto.
4	68	91	41	E. Ditto.

The frames were uncovered between 8 and 9 o'clock in the morning, and covered up in the evening with hay and mats. Air was given in the middle of the day, but none was left all night.

Monday,

Monday, December 17, 1792.

Hours.	S.Th.	P.Th.	Ther.	Wind.
7	—	—	40	S.W. Thin clouds, nearly calm.
9	84	94	41	S.W. Ditto.
10	74	93	42	S.W. Ditto.
12	70	91	45	S.W. Cloudy, and a brisk wind.
2	65	89	45	S.W. Ditto.
4	63	89	43	S.W. Ditto.

The frames were uncovered about 9 o'clock in the morning, and covered up about 4 in the evening with four inches thick of hay and mats. To-day I watered the flues, and poured some water all round against the sides of the frames to wash and sweeten them; the water that I used was about 80 degrees warm. The linings, being sunk, were raised with fresh dung. Air was given in the day-time, and a little left at each light during the night.

Tuesday, December 18, 1792.

Hours.	S.Th.	P.Th.	Ther.	Wind.
7	—	—	45	S.W. Flying clouds and standing ones above them, and which are of a reddish colour.
9	77	90	46	S.W. Cloudy, and a brisk wind.
10	70	90	48	S.W. Cloudy and windy.
12	67	89	50	S.W. Ditto.
2	66	89	51	S.W. Ditto.
4	65	88	52	S.W. Ditto.
8	—	—	50	S.W. High wind, and cloudy.

The frames were uncovered at 9 o'clock in the morning, and covered up in the evening with hay and mats. Air was admitted in the day-time, but the lights were shut close down all night.

Wednesday,

Wednesday, December 19, 1792.

Hours.	S.Th.	P.Th.	Ther.	Wind.
5	—	—	49	S.W. Clear, and a high wind.
8	—	—	47	S.W. Some clouds, windy.
9	81	93	48	S.W. Ditto.
10	67	92	49	S.W. Ditto.
12	73	91	48	S.W. Sunshine, windy.
2	69	90	47	W. Ditto.
4	67	90	45	W. Windy, and some clouds.

The frames were uncovered about 9 o'clock in the morning, and covered up at 4 in the evening with about four inches thick of hay and mats. Air was continued all day, and a little left at each light all night. The linings were examined, and put close to the sides of the frames.

Thursday, December 20, 1792.

Hours.	S.Th.	P.Th.	Ther.	Wind.
7	—	—	47	S.W. Cloudy, and a high wind.
9	70	90	49	S.W. Ditto.
10	67	90	51	S.W. Ditto.
12	66	89	52	S.W. There is a small drifting
2	67	88	48	S.W. Squally showers. [rain.
4	65	88	47	S.W. Windy and cloudy.

The frames were uncovered at 9 o'clock in the morning, and covered up at 4 in the evening with about three inches thick of hay and mats. The linings, being funk, were raised with fresh hot dung. Air was given day and night.

Friday,

Friday, December 21, 1792.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	—	—	34	W. Clear and windy.
9	58	85	35	W. Ditto.
10	59	84	36	W. Sunshine, and a high wind.
12	65	85	38	W. Ditto.
4	66	86	37	W. Cloudy and windy.
9	—	—	32	W. Clear and windy.

The frames were uncovered about 9 o'clock in the morning, and covered up about 4 in the evening with hay and mats. Air was continued all the day, but the lights were shut close down in the evening for the night. The plants were gone over, and stopped, and the weeds picked out. The plants in the west frame are the best, and they show their fruit very strong.

Saturday, December 22, 1792.

Hours.	S.Th.	P.Th.	Ther.	Wind.
7	—	—	42	S.W. Cloudy and windy.
9	80	93	42	S.W. Ditto.
10	72	92	43	S.W. Ditto.
12	67	90	42	S.W. Cloudy, and a high wind.
2	64	90	40	S.W. A heavy shower of rain.
4	60	89	38	S.W. Showery, and a high wind.
6	—	—	36	S.W. Clear, the wind is high.

The frames were uncovered at 9 o'clock in the morning, and covered up in the evening with about three inches thick of hay and mats. The linings, being funk, were raised with fresh dung just come out of the stables. Air was admitted in the day-time, and a little left at each light during the night.

Sunday,

Sunday, December 23, 1792.

Hours.	S.Th.	P.Th.	Ther.	Wind.
7	—	—	32	N.W. Clear, and a strong gale
9	72	90	31	N.W. Ditto. [of wind.
10	69	90	31	N.W. Sunshine, windy.
11	74	90	30	N.W. Ditto.
1	77	90	31	N.W. Some thin clouds.
3	67	89	29	N.W. Cloudy, windy, cold.
4	68	89	28	N.W. Ditto.
6	—	—	27	N.W. Ditto.
9	—	—	26	N.W. Ditto.

The frames were uncovered between 9 and 10 o'clock in the morning, and covered up in the evening with hay and mats.

Monday, December 24, 1792.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	—	—	29	N.W. Cloudy, and a brisk gale
8	—	—	28	N.W. Ditto. [of wind.
9	77	92	29	N.W. Ditto.
10	69	91	30	N.W. The wind is fallen,
12	50	87	30	W. The sun glimmers.
2	63	87	31	W. Thin clouds, near calm.
4	62	87	29	W. Clear, and nearly calm.
8	—	—	26	W. Thin clouds.

The frames were uncovered about 9 o'clock in the morning, and covered up in the evening with about five inches thick of hay and mats.

About noon I went over the frames, and with my hand I stirred the earth on the flues, and where I found them very dry, there I strewed a little fresh moist mould. Air was left at each light during the night.

Tuesday,

Tuesday, December 25, 1792.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	—	—	29	S.W. Clear, and nearly calm. A shower of snow had fallen in the night.
7	—	—	28	S.W. Clear, and nearly calm.
9	78	92	29	S.W. Sunshine.
10	74	91	29	S.W. Ditto.
12	75	91	34	S.W. Thin clouds.
2	71	90	35	S.W. Cloudy, and nearly calm.
4	71	90	32	S.W. Ditto.
6	—	—	32	S.W. Ditto.

The frames were uncovered at 9 o'clock in the morning, and covered up in the evening with hay four inches thick, and mats. Some air was admitted in the day-time, and a little left all the night.

Wednesday, December 26, 1792.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	—	—	38	W. Cloudy, and a brisk wind; there had been rain in the night.
9	65	89	34	W. Gloomy.
10	64	89	33	N.W. Showers of sleet.
12	63	88	32	N.W. A heavy fall of wet snow.
2	59	87	31	N.W. The snow continues to
3	58	87	30	N.W. Ditto. [fall heavily.
8	—	—	32	N.W. Windy, and some rain falls, and the snow is nearly melted.

The frames were uncovered about 9 o'clock in the morning, and covered up a little past 3 o'clock in the afternoon with about five inches thick of hay and mats.

mats. The lights were kept close shut down all the day, and remained so during the night.

Thursday, December 27, 1792.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	—	—	32	N.W. Cloudy, and but little wind.
9	80	92	33	N.W. Cloudy, and nearly calm.
10	69	91	34	N.W. Ditto.
12	70	90	36	N.W. Ditto.
2	70	90	35	N.W. Clouds here and there.
4	68	90	33	N.W. Clear, and a brisk wind.
7	—	—	28	N.W. Ditto.

The frames were uncovered at 9 o'clock in the morning, and covered up in the evening with about four inches thick of hay and mats. Air was admitted at 9 o'clock, and continued all day, and a little left all night. To-day I laid some earth round the hills, and the tops of them I covered with earth about an inch thick, and made it close to the stems of the plants. I then stopped the plants, and laid their vines out regular, and fixed them down to the hills with pegs.

Friday, December 28, 1792.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	—	—	30	W. Clear, and a brisk wind.
9	71	90	33	W. Ditto.
10	67	89	34	W. Sunshine.
12	70	89	36	W. Ditto.
2	68	88	38	N.W. Flying clouds.
4	64	88	37	N.W. Ditto. [the moon.
8	—	—	34	N.W. There is a circle about

The frames were uncovered about 9 o'clock in the morning,

morning, and covered up at 4 in the evening with hay and mats. The linings, being funk, were raised with fresh dung. Air was admitted day and night.

Saturday, December 29, 1792.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	—	—	35	S. Cloudy ; there had been rain in the night.
9	76	92	38	S.W. Cloudy.
10	71	91	39	S.W. Ditto.
12	73	90	45	S.W. Gloomy.
2	71	90	46	S.W. Ditto.
4	69	89	45	S.W. Ditto.

The frames were uncovered at 9 o'clock in the morning, and covered up in the evening with about four inches thick of hay and mats. In the afternoon a layer of fresh dung was laid on the linings. Air was continued at each light day and night.

Sunday, December 30, 1792.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	—	—	44	N.W. It rains.
9	76	93	42	N.W. Ditto.
10	71	92	43	N.W. Fair, cloudy.
1	77	92	43	W. Sunshine.
2	75	92	42	W. Cloudy.
4	70	92	39	W. Clouds here and there.
8	—	—	30	W. Clear, and near calm.

The frames were uncovered at 9 o'clock in the morning, and covered up in the evening with hay and mats.

Monday,

Monday, December 31, 1792.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	—	—	23	W. Clear and calm.
7	—	—	24	W. Ditto.
8	—	—	22	W. Clear, and a brisk air of
9	80	94	24	W. Ditto. [wind.
10	72	93	24	W. Thin clouds cover the sky.
12	75	93	28	W. Sunshine.
1	72	92	29	W. A thick fog.
2	69	91	28	W. Ditto.
4	65	91	27	W. Ditto.
8	—	—	21	W. The thick fog continues, and it has a bad smell.

The frames were uncovered about 9 o'clock in the morning, and covered up at 4 in the evening with about five inches thick of hay and mats. To-day I went over the plants, and stopped them, and nipped off some of the male blossoms where they were in clusters. To-day I had some dung put together in a heap to heat, to make a lining for the south side of the bed. But little air was given in the day-time, and the lights were shut close down all night.

Tuesday, January 1, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	—	—	30	S. E. Cloudy, and a brisk wind.
9	80	94	31	S. E. Ditto.
10	71	93	34	S. Ditto.
12	63	91	34	S. It rains a little.
2	63	90	33	S. Fair and cloudy.
4	60	89	33	S. Flying thick clouds, but
10	—	—	32	S. E. Cloudy. [little wind.

The frames were uncovered about 9 o'clock in the morning, and covered up about 4 in the evening with
five

five inches thick of hay and mats. Air was admitted in the day-time, and a little left at each light during the night.

Wednesday, January 2, 1793.

Hours. S.Th. P.Th. Ther. Wind.

6	—	—	32	N.W.	Cloudy, there had been rain in the night; the air is full of moisture.
9	74	93	31	N.W.	Foggy, and snow falls.
10	72	93	31	N.W.	Ditto.
12	70	91	32	N.W.	Cloudy, and a brisk wind.
2	67	90	32	N.W.	Cloudy, and nearly calm.
4	66	89	34	N.W.	Ditto.
9	—	—	32	N. E.	Ditto.

The frames were uncovered about 9 o'clock in the morning, and covered up in the evening with about five inches thick of hay and mats. To-day I had a fresh lining put to the south side of the bed, in doing which, I had the fresh dung that was on the top of the old lining laid aside, and all the exhausted dung taken away; and the dung that had been on the top of the lining, and was not exhausted, that I had worked into the foundation of the new lining, and then had fresh dung laid above it. The lining was made about three feet wide at the foundation, and tapered up to about twenty-eight inches at the top.

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Thursday,

Thursday, January 3, 1793.

Hours. S.Th. P.Th. Ther. Wind.

6	—	—	27	W. A thick fog.
9	76	89	27	W. Ditto.
10	70	88	28	W. Ditto.
12	67	87	30	W. Ditto.
4	68	87	31	W. Ditto.
8	—	—	30	W. Clear and calm.

The frames were uncovered at 9 o'clock in the morning, and covered up in the evening with about four inches thick of hay and mats. Air was continued day and night. The lining that was made up yesterday, being sunk, was raised with fresh dung. I went over the plants, and stopped them, and picked some male blossoms off.

Friday, January 4, 1793.

Hours. S.Th. P.Th. Ther. Wind.

6	—	—	29	E. Cloudy, and a brisk wind.
9	76	92	29	E. Heavy clouds come from the east.
10	70	91	30	E. Cloudy, and but little wind.
12	68	90	33	E. Ditto.
2	64	90	32	E. Ditto.
3	63	90	30	E. Ditto.
4	62	89	28	E. Ditto.
8	—	—	24	E. Ditto.

The frames were uncovered about 9 o'clock in the morning, and covered up about 4 in the evening with four inches thick of hay and mats. The linings were examined, and put close to the sides of the frames, and the south side lining, being sunk, was raised. A great steam kept rising out of it all day.

Saturday,

Saturday, January 5, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	—	—	29	S. Cloudy and windy.
9	70	90	32	S. Ditto.
10	63	90	33	S. Ditto.
12	67	90	35	S. It rains.
2	69	90	36	S.W. Ditto.
4	67	90	38	S.W. Ditto.
7	—	—	38	S.W. Clear, and a brisk wind.

The frames were uncovered at 9 o'clock in the morning, and covered up in the evening with three inches thick of hay and mats. Air was admitted in the day-time, and a little left at each light during the night.

Sunday, January 6, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	—	—	30	W. Clear, and a brisk wind.
9	77	94	31	W. Ditto.
10	71	94	32	W. Ditto.
11	73	94	34	W. Sunshine.
12	76	94	38	W. Scattered clouds.
2	76	94	37	N.W. Sunshine.
4	70	93	34	N.W. Clear, and a brisk wind.
9	—	—	27	N.W. Clear, and near calm.

The frames were uncovered about 9 o'clock in the morning, and covered up about 4 in the evening with five inches thick of hay and mats. Air was given in the day-time, but the lights were shut close down all night.

Monday, January 7, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
5	—	—	22	W. Clear and calm.
8	—	—	23	W. The sky is overcast with thin
9	82	97	26	W. Thin clouds. [clouds.
10	74	96	33	W. Ditto.
12	68	95	38	S. A sprinkling of rain.
2	68	94	37	S. Cloudy and windy.
4	67	94	37	S. Ditto.

The frames were uncovered about 9 o'clock in the morning, and covered up in the evening with about four inches thick of hay and mats. Air was admitted at 9 o'clock, and continued all day, and some left all night. The linings were raised with fresh dung. In the afternoon I went over the plants, and stopped them, and thinned out some of the oldest leaves, and pegged down the shoots of the plants, and picked off the dead male blossoms.

Tuesday, January 8, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	—	—	46	S.W. It rains, and there had been a great deal of rain in the night.
8	—	—	44	S.W. Fair and cloudy.
9	78	95	45	S.W. Scattered clouds, and a
10	74	95	46	S.W. Ditto. [brisk wind.
12	75	95	45	N.W. Ditto.
1	76	95	44	N.W. Sunshine.
2	75	95	44	N.W. Ditto.
4	70	94	40	N.W. Clear, and a brisk wind.
7	—	—	32	N.W. Ditto.

The frames were uncovered a little before 9 o'clock in

in the morning, and covered up in the evening with about three inches thick of hay and mats. Air was admitted day and night.

Wednesday, January 9, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	—	—	26	N.W. Clear, and nearly calm.
9	80	96	28	N.W. Ditto.
10	75	96	30	N.W. Sunshine.
11	82	96	33	N.W. Ditto.
1	82	96	36	N.W. Ditto.
2	82	97	37	S. E. The sun shines faintly.
4	75	97	35	S. E. Thin clouds cover the
7	—	—	34	S. E. Ditto. [fky.

The frames were uncovered about 9 o'clock in the morning, and covered up in the evening with about two inches thick of hay and mats. Air was continued all the day, and a little left at each light during the night. In the forenoon I went over the plants, and stopped them, thinned their leaves, and set some fruit that were in blossom. The linings were examined, and put close to the sides of the frames.

Thursday, January 10, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	—	—	37	S. Windy, and thick flying clouds.
9	70	95	40	S. Ditto, and a small rain.
10	68	95	42	S. Ditto. [clouds.
12	67	95	46	S. Fair, and flying great
2	69	95	48	S.W. Ditto.
4	67	95	46	S.W. Clear, and a brisk wind.
7	—	—	42	S.W. Ditto.

The frames were uncovered at 9 o'clock in the

morning, and covered up at 4 in the evening with about two inches thick of hay and mats. Air was continued day and night.

Friday, January 11, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	—	—	40	S.W. Cloudy; there had been rain in the night.
9	75	96	42	S.W. Cloudy, and a brisk gale
10	74	95	43	S.W. Sunshine. [of wind.
12	60	80	43	S.W. Clouds here and there.
2	56	74	43	S.W. Sunshine.
4	54	75	42	S. It begins to rain, and the wind is high. [rain.
5	—	—	42	S. High wind, and some
7	—	—	42	S. Fair, cloudy, windy.

The frames were uncovered about 9 o'clock in the morning, and covered up in the evening with about three inches thick of hay and mats. To-day I laid some earth round each hill, and covered the surface of the hills among the plants about half an inch thick with fine sifted leaf earth. I then stopped the plants, thinned their leaves, and laid the shoots out regular on the hills, and pegged them down to the earth with little wooden pegs, and I removed the plunged thermometer, and set it in the hill about ten inches north from the stems of the plants, with its bulb six inches below the surface of the earth; I made the earth close to its tube to prevent the external air in the bed from penetrating too quickly to the bulb; I set the other thermometer by it with its bulb on the surface of the earth of the hill, and I stuck a stick into

into the hill for the surface thermometer to lean against.

Saturday, January 12, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
5	—	—	36	S. Cloudy, and a high wind; there had much rain in the night. [high.
8	—	—	38	S.W. It rains, and the wind is
9	69	80	39	S.W. It rains heavily, gloomy.
10	64	80	38	S.W. Fair, cloudy.
12	68	80	40	S.W. Sunshine, windy.
2	70	80	40	S.W. Ditto.
4	67	80	38	S.W. Clear, windy.
8	—	—	35	W. Cloudy, windy.

The frames were uncovered about 9 o'clock in the morning, and covered up in the evening with about three inches thick of hay and mats. The linings were raised with fresh dung.

Sunday, January 13, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	—	—	31	S.W. Clear, and near calm.
8	—	—	32	S.W. Clouds here and there.
9	75	84	33	S.W. Sunshine.
10	72	84	35	S. Ditto.
11	75	85	36	S. Ditto.
1	85	87	42	S. Ditto.
2	85	87	42	S. Clouds here and there.
4	73	86	38	S. Ditto.
8	—	—	34	S. E. Clear, and a brisk wind.

The frames were uncovered about 9 o'clock in the morning, and covered up in the evening with hay and mats.

Monday, January 14, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	—	—	32	E. Foggy.
9	78	87	35	E. Showery.
10	70	86	36	N. E. Ditto.
12	64	84	38	N. E. Cloudy, and a brisk wind.
2	67	83	38	N. E. Ditto.
4	65	83	38	N. E. Ditto. [wind.
7	—	—	33	N. E. Clear, and a brisk gale of

The frames were uncovered about 9 o'clock in the morning, and covered up in the evening with about four inches thick of hay and mats. Air was given day and night. In the forenoon I went over the plants, and stopped them, thinned their leaves, and laid the vines out regular.

Tuesday, January 15, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	—	—	32	N. E. Cloudy and windy.
8	—	—	33	N. E. Ditto.
9	80	88	33	N. E. Ditto.
10	68	86	34	N. E. Ditto.
12	65	85	35	N. E. A little snow falls.
2	60	83	34	N. E. Ditto.
4	57	81	33	N. E. Windy, cloudy, gloomy.
7	—	—	32	N. E. Windy.

The frames were uncovered about 9 o'clock in the morning, and covered up in the evening with about three inches thick of hay and mats. Air was continued day and night. To-day I had the fresh dung taken from off the north side lining, and laid aside, and then the rotten part in the bottom carried away, and

and the unexhausted dung that was on the top worked into the bottom part, and the deficiency made up with fresh dung. The lining was made near three feet wide in the foundation, and tapered up to about twenty-six inches at the top.

Wednesday, January 16, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	—	—	30	N. E. Cloudy, cold, and windy.
8	—	—	30	N. E. Ditto.
9	58	81	30	N. E. Ditto.
10	55	81	31	N. E. Ditto.
12	56	80	31	N. E. Ditto.
2	55	80	31	N. E. Ditto.
4	54	79	31	N. E. Ditto.

The frames were uncovered about 9 o'clock in the morning, and covered up about 4 o'clock with about four inches thick of hay and mats. The linings were examined, and put close to the sides of the frames. Air was given in the day-time, and a little left at each light all night. As the weather is so cold and windy, it would have been better not to have changed the back lining yesterday, but to have deferred it for some days longer, by which the heat would have been kept more steady, which is a great advantage, especially in windy weather.

Thursday,

Thursday, January 17, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	—	—	31	N. Foggy.
8	—	—	32	N. Ditto.
9	78	81	33	N. E. It rains.
10	68	81	35	N. E. Cloudy, and a brisk gale
12	68	80	35	N. E. Ditto. [of wind.
2	61	79	31	N. E. Ditto.
4	57	79	30	N. E. Ditto.
10	—	—	29	N. E. Ditto.

The frames were uncovered about 9 o'clock in the morning, and covered up about 4 in the evening with hay and mats; but little air was given in the day-time, and the lights were shut close down all night,

Friday, January 18, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	—	—	29	N. E. Cloudy, and windy.
9	70	81	30	N. E. Ditto.
10	63	80	31	N. E. Ditto.
11	67	80	32	N. E. Scattered clouds.
12	70	80	32	N. E. Ditto.
2	72	81	31	N. E. Sunshine.
3	69	82	31	N. E. Clouds here and there.
4	63	81	29	N. E. Clear, and the wind is fallen.
8	—	—	27	N. E. Clear, and near calm.
10	—	—	22	N. E. Ditto.

The frames were uncovered a little before 9 o'clock in the morning, and covered up in the evening with about four inches thick of hay and mats; but little air was given in the day-time, and the lights were shut close down in the evening for the night.

Saturday,

Saturday, January 19, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	—	—	19	N. E. Clear, calm, and a white
8	—	—	19	N. E. Ditto. [frost.
9	72	82	20	N. E. Sunshine.
10	68	82	22	N. E. Ditto.
11	72	82	25	N. E. Ditto.
12	76	83	26	N. W. Ditto.
1	78	84	27	N. W. Ditto.
2	75	85	27	N. W. The sun shines faintly.
4	68	85	26	N. W. Ditto.
5	—	—	26	N. W. There is a thick fog, which has a disagree- able smell.
8	—	—	24	N. W. Foggy.
10	—	—	25	N. W. The fog is got high.

The frames were uncovered about 9 o'clock in the morning, and covered up in the evening with about four inches thick of hay and mats. The lights were kept close shut down till 1 o'clock, when a little air was admitted, and continued till 3 o'clock, and then the lights were shut down again for the night. The linings were raised as high as the surface of the mould in the frames with hot dung.

About 3 o'clock in the afternoon, by trial, I found the water underneath the ice in the pond to raise the thermometer to 35, and that running out of a pipe into the pond, raised it to 39, and the spring from whence the said water came, raised it to 45 degrees; so that the water, by running about a quarter of a mile through the pipe in the earth, had become six degrees colder than when in the spring.

Sunday,

Sunday, January 20, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	—	—	28	W. The air is thick, and a
9	85	90	29	W. Ditto. [white frost.
10	78	89	30	W. Ditto.
11	75	89	31	W. Ditto.
1	73	88	32	W. Gloomy.
2	71	88	32	W. Ditto.
4	68	87	31	W. Ditto.
6	—	—	29	W. Cloudy, and but little wind.

The frames were uncovered about 9 o'clock in the morning, and covered up at 4 in the evening with about four inches thick of hay and mats. Air was given at 10 o'clock, and continued all the day, and a little left at each light all night.

Monday, January 21, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	—	—	29	S.W. Thin clouds, near calm.
8	—	—	28	S.W. Ditto.
9	86	92	29	S.W. Ditto.
10	78	91	31	S.W. Ditto.
12	73	90	36	S.W. Ditto.
2	73	89	36	S.W. Cloudy, and a brisk wind.
4	69	88	34	S.W. Ditto.
7	—	—	29	S.W. Clear, and nearly calm.
9	—	—	27	S.W. Ditto.

The frames were uncovered about 9 o'clock in the morning, and covered up in the evening with about three inches thick of hay and mats. Air was continued all day, and a little left all night. The north side lining, being funk, was raised with fresh dung.

In

In the forenoon I went over the plants, stopped them, thinned their leaves, and put pieces of glass under some set fruit.

Tuesday, January 22, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	—	—	31	S.W. Thin clouds, nearly calm.
9	82	92	33	S.W. Gloomy.
10	76	91	35	S.W. Ditto.
12	76	90	39	S.W. Ditto.
2	67	90	38	S.W. Ditto.
4	68	89	35	S.W. Ditto.
7	—	—	33	S.W. Ditto.

The frames were uncovered a little before 9 o'clock in the morning, and covered up about 4 in the evening with hay and mats. Air was given in the day-time, and a little left at each light all night. To-day the linings were well watered

Wednesday, January 23, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	—	—	30	S.W. Dull cloudy morning.
9	78	91	33	S.W. Cloudy, and but little
10	73	90	34	S.W. Ditto. [wind.
12	68	88	37	S.W. Ditto.
4	62	87	33	S.W. Ditto.
8	—	—	34	S.W. Ditto.

The frames were uncovered at 9 o'clock, and covered up in the evening with about two inches thick of hay and mats. At noon I went over the plants and stopped them, and thinned their leaves, and laid out their vines regularly. I also stirred here and there the

the mould on the flues, and on those parts where I found the mould dry, there I strewed on some that was moist. Air was continued night and day.

Thursday, January 24, 1793.

Hours. S.Th. P.Th. Ther. Wind.

6	—	—	36	S.W. Cloudy, and near calm.
8	79	90	38	S.W. Ditto.
10	72	89	41	S.W. It begins to rain.
12	67	87	42	S.W. It rains gently.
2	66	87	42	S.W. Small rain.
4	66	87	42	S.W. Ditto.
7	—	—	42	S.W. Ditto.

The frames were uncovered about 8 o'clock in the morning, and covered up in the evening with about three inches thick of hay and mats. Air was given in the day-time, and a little left at each light all night. The north side lining was very hot, and a great steam rising out of it, therefore water was poured upon it plentifully

Friday, January 25, 1793.

Hours. S.Th. P.Th. Ther. Wind.

6	—	—	36	N.E. It rains, and there had been much rain in the night.
8	72	88	36	N.E. It rains lightly.
10	67	87	37	N.E. Fair, gloomy.
12	68	86	38	N.E. Ditto.
2	67	86	37	N.E. Ditto.
4	69	86	35	N.E. Ditto.
10	—	—	28	N.E. Clear, and nearly calm.

The frames were uncovered about 8 o'clock in the morning,

morning, and covered up between 4 and 5 in the evening with hay and mats. In the forenoon I went over the plants, and stopped them, thinned their leaves, and those fruit that I found in blossom I set. A little air was continued day and night. The linings, being funk, were raised with dung fresh from the stables.

Saturday, January 26, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	—	—	22	N. Clear, and nearly calm.
9	80	90	24	N.E. Ditto.
10	80	90	26	S.E. Sunshine.
12	83	91	31	S.E. Ditto.
1	76	90	34	S.E. Cloudy.
3	72	90	33	S.E. Ditto.
4	68	89	30	S.E. Ditto.
7	—	—	25	S.E. Clear, and nearly calm.

The frames were uncovered at 9 o'clock in the morning, and covered up in the evening with four inches thick of hay and mats. About noon I went over the plants, and stopped them, and set the fruit that were in blossom. Air was continued day and night at every light.

Sunday, January 27, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	—	—	28	S.W. Cloudy, gloomy.
9	79	92	32	S.W. Snow falls.
10	73	91	33	S.W. Cloudy.
11	72	90	35	S.W. Thin clouds.
1	76	90	38	S.W. The sun glimmers.
2	77	91	39	S.W. Cloudy.
4	68	90	37	W. Ditto.
9	—	—	33	W. Ditto.

The frames were uncovered about 9 o'clock in the morning,

morning, and covered up in the evening with hay and mats ; air was given in the day-time, but the lights were shut close down all night.

Monday, January 28, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	—	—	36	W. Cloudy and gloomy.
9	84	94	38	W. Ditto.
10	80	93	40	W. Thin clouds.
12	85	93	45	W. Bright sunshine.
1	88	94	47	W. Ditto.
2	89	94	48	W. Ditto.
4	77	93	44	W. Small clouds here and there.

The frames were uncovered a little before 9 o'clock in the morning, and covered up in the evening with about four inches thick of hay and mats. Air was given at 9 o'clock in the morning, and continued all day, and a little left at every light all night.

To-day I mixed together the moist and dry mould that lay on the flues, and laid it round the sides of the hills ; and I laid about an inch thick of it among the stems and vines of the plants ; and having made the surface of the hills level, I trained the plants out carefully, and pegged them down here and there at their joints, lightly covering those part with mould, in order that they might strike root, and thereby strengthen themselves. The hills now on all sides cover about three inches of the surface of the flues, and the other parts of the flues are left nearly bare of mould.

Tuesday,

Tuesday, January 29, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	—	—	37	S.W. Cloudy, and a brisk wind.
9	72	92	39	S.W. Ditto.
10	74	92	42	S.W. Ditto.
1	76	91	50	S.W. The sun glimmers.
2	70	91	47	S.W. Cloudy, and it rains a little.
4	70	91	46	S.W. Cloudy, and a brisk gale
7	—	—	45	S.W. Ditto. [of wind.

The frames were uncovered about 9 o'clock in the morning, and covered up in the evening with three inches thick of hay and mats. Air was continued day and night. About 11 o'clock I gave the plants a moderate watering, in doing which I gave most round the sides of the hills close to the flues, for there the heat is always greatest. I also watered the plants all over their leaves, and poured some on the flues and against the sides of the frames, to wash and sweeten them. The water was 76 degrees warm.

Wednesday, January 30, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	—	—	37	W. Cloudy, and a brisk wind.
9	77	92	35	N.W. Ditto.
10	70	91	36	N.W. Ditto.
11	72	91	37	N.W. Sunshine.
12	70	91	37	W. Ditto.
2	68	91	38	W. Windy, and some clouds.
3	71	91	39	W. Ditto.
4	64	90	37	W. Clouds here and there.
8	—	—	35	W. Cloudy, and a brisk gale [of wind.

The frames were uncovered at 9 o'clock in the morning,

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morning, and covered up in the evening with about three inches thick of hay and mats. Air was given day and night. At noon I went over the plants, and stopped them, thinned their leaves, and set the fruit in blossom. To-day I began to cut fruit.

Thursday, January 31, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	—	—	29	W. Clear, and a brisk gale of
9	70	88	32	W. Ditto. [wind.
10	72	88	35	W. Sunshine.
12	75	89	42	W. The air is overcast with
2	65	88	42	W. Cloudy. [thin clouds.
4	70	88	40	W. Ditto.
7	—	—	37	W. Ditto.
10	—	—	39	W. Ditto.

The frames were uncovered about 9 o'clock in the morning, and covered up between 4 and 5 in the evening with about four inches thick of hay and mats. The linings, being sunk, were raised with fresh dung. Air was given in the day-time, but the lights were shut down close all night. I went over the plants and stopped them, and set the fruit in blossom, and nipped off several male and female blossoms where they were too thick.

Friday,

Friday, February 1, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	—	—	38	S. It rains lightly.
9	84	91	42	S. Ditto.
10	78	91	43	S. Cloudy, and a brisk wind.
11	72	90	43	S. Ditto.
12	77	90	44	S. Scattered clouds. [then.
1	84	91	45	S. The sun shines now and
2	80	91	45	S. Windy, and some clouds.
4	74	91	43	S. Cloudy, windy.
10	—	—	37	W. Clear, and a brisk wind.

The frames were uncovered at 9 o'clock in the morning, and covered up in the evening with about three inches thick of hay and mats. But little air was given to-day. The lights were shut down at 3 o'clock, and remained so all night. At noon I went over the plants, and stopped them, set the fruit in bloffom, and thinned the leaves where wanted.

Saturday, February 2, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
7	—	—	31	S.W. Clear, and a brisk wind.
9	88	95	35	S.W. There is a rainbow in the w. ft.
10	80	95	36	S.W. Sunshine, and a brisk
11	76	93	38	S.W. Showers of rain. [wind.
12	74	92	41	S.W. Squally showers.
2	70	91	43	S.W. Ditto.
4	63	90	42	S.W. Showery and windy.
6	—	—	42	S.W. High wind and showers.
10	—	—	42	S.W. Ditto.

The frames were uncovered at 9 o'clock in the morning,

morning, and covered up in the evening with about three inches thick of hay and mats. Air was given in the day-time, and a little left at each light during the night. To-day the linings were watered.

Sunday, February 3, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
7	—	—	38	S.W. Clear, and a brisk gale
9	69	88	40	S.W. Ditto. [of wind.
10	68	87	43	S.W. Scattered clouds, windy.
11	68	87	44	S.W. Showery and windy.
1	71	87	45	S.W. Windy, and flying clouds.
4	57	86	39	S.W. Ditto.

The frames were uncovered about 9 o'clock in the morning, and covered up in the evening as usual. Air was continued day and night.

Monday, February 4, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
7	—	—	34	S.W. Clouds here and there.
9	76	88	37	S.W. Cloudy, and a brisk wind.
10	70	87	38	S.W. Ditto.
12	70	87	42	S.W. Sunshine.
1	80	87	42	S.W. The sun shines faintly.
2	78	88	41	S.W. Ditto.
4	70	88	39	S.W. Clouds here and there.
8	—	—	33	S.W. Clear, and nearly calm.

The frames were uncovered at 9 o'clock in the morning, and covered up between 4 and 5 in the evening with about three inches thick of hay and mats. Air was given in the day-time, and a little

little left all night at each light. I went over the plants and stopped them, thinned their leaves, and set the fruit that were in blossom. The mould on the flues was got quite dry, therefore I had it taken off, and the flues swept with a hair hand-broom: This being done, I took water warmed to about 75 degrees, and poured plenty of it on the flues, and against the sides of the frames all round about. Having thus done, I shut the lights close down for about twenty minutes, and then gave air.

Tuesday, February 5, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	—	—	31	S. Calm, and but few clouds.
9	80	89	33	S. Ditto.
10	77	89	36	S. E. Foggy, clouds.
12	78	88	39	S. E. The sun glimmers.
2	80	89	40	N. Sunshine.
4	73	89	38	N. W. Clouds here and there.
8	—	—	30	N. E. Ditto.

The frames were uncovered about 9 o'clock, and covered up between 4 and 5 in the evening with about three inches thick of hay and mats. About 4 o'clock I took water 80 degrees warm, and therewith I watered the sides of the hills all round, and then gave each hill of plants a small pot full of water all over their leaves; also I sprinkled the flues, and sides of the frames. The plants were stopped, their leaves thinned, and the fruit in blossom set.

Wednesday, February 6, 1793.

Hours.	S.Th	P.Th.	Ther.	Wind.
6	—	—	33	S.W. It rains lightly.
9	82	89	38	S.W. Ditto.
10	74	89	42	W. The sun shines faintly.
12	80	89	45	N.W. Ditto.
1	82	89	45	N.W. High foggy clouds.
2	76	89	43	N.W. Cloudy, and a brisk wind.
4	72	89	41	N.W. Ditto.
10	—	—	37	N.W. It has rained since 7 o'clock.

The frames were uncovered about 9 o'clock in the morning, and covered up in the evening with about four inches thick of hay and mats. I went over the plants, and stopped them, thinned their leaves, set the fruit in blossom, and picked out the weeds and the dead blossoms. Air was given the greatest part of the day, and a little left all night. The north side lining was raised with fresh dung,

Thursday, February 7, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	—	—	31	W. Cloudy; there had been much rain in the night, and the earth is covered with snow.
8	—	—	32	W. Clear in the north-west.
9	80	89	31	N.W. Cloudy in the east.
10	77	89	33	N.W. Sunshine.
12	85	89	38	N.W. The snow is nearly gone.
1	87	89	38	N.W. Sunshine.
2	86	90	38	N.W. Scattered clouds.
4	75	90	36	N.W. Ditto.
10	—	—	33	N.W. Clouds here and there.

The frames were uncovered at 9 o'clock, and covered

covered up at half past 4 in the evening with about three inches thick of hay and mats. At 3 o'clock I took water 85 degrees warm, and watered well therewith the outsides of the hills all round, and poured some on the flues. A little air was then given, and let remain all night.

To-day the south side lining was turned over, and well shaken, and made up again, and some fresh dung laid on the top of it.

Friday, February 8, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	—	—	32	S.W. Cloudy, and a brisk wind.
9	72	87	36	S.W. Cloudy and windy.
10	68	86	40	S.W. Windy, and it rains.
12	67	84	43	S.W. It rains hard.
1	62	82	38	S.W. Fair ; the sun appears.
4	66	82	42	S.W. Cloudy and windy.
7	—	—	40	S.W. Ditto.

The frames were uncovered at 9 o'clock in the morning, and covered up in the evening with about four inches thick of hay and mats. I went over the plants, and set the fruit in blossom. But little air was given in the day-time, and the lights were shut down in the evening for the night.

Saturday, February 9, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.	
6	—	—	34	W.	Thin clouds cover the sky.
9	73	81	38	W.	Cloudy, and but little
10	70	81	40	W.	Ditto. [wind.
12	70	81	45	W.	The sun glimpses.
2	74	81	46	S.W.	Ditto.
4	68	81	45	S.	Cloudy.
10	—	—	40	S.	Ditto.

The frames were uncovered at 9 o'clock, and covered up in the evening with about four inches thick of hay and mats. I went over the plants and stopped them, thinned their leaves, and set the fruit in blossom. About 4 o'clock I took water about 78 degrees warm, and watered the sides of the hills, and poured some on the flues. Air was given in the day-time, and a little left all night at each light.

Sunday, February 10, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.	
6	—	—	32	W.	Clear, and a strong gale of
9	68	80	34	W.	Ditto. [wind.
10	69	80	37	W.	Windy, and flying clouds.
11	69	80	38	W.	High wind, and some clouds.
1	70	80	38	W.	Ditto.
2	72	80	36	W.	A shower of dry hail.
4	68	80	36	W.	High wind, and some clouds.
9	—	—	33	W.	Ditto.

The frames were uncovered about 9 o'clock in the morning, and covered up in the evening with hay and mats. Air was given till 1 o'clock, when the lights were close shut down for the night.

Monday,

Monday, February 11, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	—	—	34	N.W. Clear, and a high wind; the wind was very high in the night.
9	77	82	37	N.W. Sunshine., windy.
10	77	82	37	N.W. Ditto.
12	80	83	38	N.W. Ditto.
2	78	84	38	N.W. Scattered clouds.
4	72	83	37	N.W. Ditto. [of wind.
9	—	—	36	N.W. Cloudy, and a brisk gale

The frames were uncovered about 9 o'clock, and covered up between 4 and 5 in the evening with about four inches thick of hay and mats. In the forenoon I went over the plants, and stopped them, thinned their leaves, and set the fruit in blossom. Air was given in the day-time, and the lights were shut close down all night. A little earth was laid all round the outsides of each hill to cover the roots of the plants, which were come through the hills very thick.

Tuesday, February 12, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	—	—	38	W. Cloudy, and a brisk wind.
9	70	82	41	W. Ditto.
10	70	82	44	W. Ditto.
12	72	82	47	W. Scattered flying clouds.
2	79	83	47	N.W. Ditto.
4	70	83	43	N.W. Cloudy and windy.
7	—	—	42	W. Ditto.

The frames were uncovered about 9 o'clock in the morning, and covered up in the evening with about four

four inches thick of hay and mats. The linings, being sunk, were raised with fresh dung. In the forenoon I went over the plants and stopped them, thinned their leaves, and set the fruit in blossom. At 3 o'clock I took water 80 degrees warm, and gave the sides of the hills all round a good watering, and sprinkled some of it on the flues. But little air was given in the day-time, and the lights were shut close down during the night.

Wednesday, February 13, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	—	—	35	S.W. Cloudy, and but little wind. [sun.
8	81	85	36	S.W. The sky is red before the
10	73	84	39	S.W. It rains very lightly.
12	75	84	48	S.W. Cloudy.
2	76	84	50	S.W. Ditto.
4	72	84	50	S.W. Ditto.
5	68	84	48	S.W. Ditto.
7	—	—	46	S.W. Ditto.

The frames were uncovered at 8 o'clock in the morning, and covered up about 5 o'clock in the evening with about three inches thick of hay and mats. In the forenoon I went over the plants, and stopped them, thinned their leaves, and set the fruit in blossom, and I nipped off several of the showing fruit and male blossoms where they were too thick. I poured water on the flues and sides of the frames all round; the water was about 78 degrees warm. Air was given in the day-time, and a little left at each light all night.

Thursday,

Thursday, February 14, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	—	—	44	S.W. Windy, and a small dri-
8	74	84	45	S.W. Ditto. [ving rain.
10	68	83	44	W. It rains.
12	66	82	39	N.W. Ditto.
2	76	83	43	N.W. Sunshine.
4	70	83	41	W. Clouds here and there.
7	—	—	35	W. Clear, and nearly calm.

The frames were uncovered about 8 o'clock in the morning, and covered up in the evening with three inches thick of hay and mats. The lights were shut down at 11 o'clock, and remained so till about 1 o'clock, when a little air was given and continued all night. I went over the plants and stopped them, thinned their leaves, and set the fruit in blossom, and picked off several of the showing and set fruit where they were too thick.

Friday, February 15, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	—	—	34	S.W. It rains.
8	72	83	36	S.W. Ditto.
10	68	82	37	S.W. Ditto.
12	72	83	39	S.W. Fair, gloomy.
2	70	82	40	S.W. Thick moist air.
4	68	82	39	S.W. It rains gently.
5	67	82	38	S.W. Fair, gloomy.
7	—	—	36	S.W. Ditto.

The frames were uncovered about 8 o'clock in the morning, and covered up at 5 in the evening with three inches thick of hay and mats.

I looked

I looked over the plants, and stopped them, thinned their leaves, and set the fruits in blossom. But little air was given in the day-time, and the lights were shut down all night. The linings were raised with dung just taken out of the stables.

Saturday, February 16, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	—	—	30	N. E. Cloudy in the horizon.
9	79	85	31	N. E. Cloudy.
10	75	85	34	N. E. The sun shines faintly.
12	77	84	37	N. E. Ditto.
2	80	84	38	N. E. Ditto.
4	75	84	37	N. E. Cloudy, and but little
5	71	86	36	N. E. Ditto. [wind.

The frames were uncovered at 9 o'clock, and covered up in the evening with about four inches thick of hay and mats. In the forenoon I went over the plants, and stopped them, thinned their leaves, set the fruit in blossom, and picked out of the mould some weeds. Air was admitted in the day-time, and the lights shut down all night.

Sunday, February 17, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	—	—	29	N. E. Foggy, nearly calm.
9	82	86	31	N. E. Ditto.
11	76	85	37	N. E. Foggy clouds.
1	75	85	39	N. E. Cloudy, gloomy.
4	70	85	37	N. E. Ditto.

The frames were uncovered about 9 o'clock in the morning, and covered up in the evening with about three

three inches thick of hay and mats. But little air was given in the day-time, and less during the night.

Monday, February 18, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	—	—	34	S.W. Thin clouds, and a brisk
8	80	86	35	S.W. Cloudy. [wind.
10	74	85	37	S.W. Ditto.
12	70	84	42	S.W. It rains lightly.
2	68	84	43	S.W. Ditto.
4	70	83	41	W. Cloudy.
5	—	—	40	N. E. Ditto.

The frames were uncovered between 8 and 9 o'clock in the morning, and covered up a little past 4 with about three inches thick of hay and mats. About two o'clock I poured plenty of water on the flues all round the plants, and those parts of the sides of the hills that were getting dry I watered plentifully. The water that I used was about 80 degrees warm.

After watering, the lights were shut down for about an hour, and then a little air was given at each light, and continued all night. The plants were looked over and stopped, their leaves thinned, and the fruit in blossom set.

Tuesday,

Tuesday, February 19, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	—	—	26	S.W. Clear, and but little wind.
8	79	85	28	S.W. Ditto.
10	80	85	35	S.W. Sunshine.
12	85	86	38	S.W. Ditto.
2	84	86	39	S.W. Ditto.
4	77	86	39	S.W. Ditto.
5	76	86	38	S.W. Clear, and near calm.

The frames were uncovered about 8 o'clock in the morning, and covered up at 5 in the evening with about three inches thick of hay and mats.

In the forenoon I went over the plants and stopped them, thinned their leaves, and set the fruit in blossom. Air was given plentifully in the day-time, and a little all night.

Wednesday, February 20, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	—	—	27	N.W. Clear, and nearly calm.
8	79	85	26	N.W. Ditto.
9	75	85	29	N.W. Sunshine.
11	87	86	35	N.W. Ditto.
12	87	87	39	N.W. Ditto.
2	90	88	41	N.W. Ditto.
3	90	89	42	S.W. Scattered clouds.
4	84	89	40	S.W. Ditto.

The frames were uncovered at 9 o'clock in the morning, and covered up in the evening with about two inches thick of hay and mats. Air was given in the day-time, and a little left at each light all night. The plants were gone over and stopped, their leaves thinned, and the fruit in blossom set.

Thursday,

Thursday, February 21, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	—	—	31	S.E. White frost, some clouds, but little wind.
8	80	85	32	S.W. Clear, and a brisk wind.
10	81	85	34	S.W. Sunshine, and a brisk gale
12	85	85	37	S.W. Ditto. [of wind.
2	86	86	39	S.W. Ditto.
4	80	86	40	S.W. Ditto.
8	—	—	32	S.W. Clear, and nearly calm.

The frames were uncovered at 8 o'clock in the morning, and covered up in the evening with about three inches thick of hay and mats. Plenty of air was admitted in the day-time, and a little left all night. I went over the plants in the forenoon, and stopped them, thinned their leaves, and set the fruit in blossom.

Friday, February 22, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	—	—	25	S.W. Clear, and nearly calm.
8	75	83	26	S.W. Ditto.
10	82	83	29	S.W. Sunshine.
12	90	85	38	S.W. Ditto.
2	88	85	40	S.W. Ditto.
4	80	85	39	S.W. Ditto.

The frames were uncovered about 8 o'clock in the morning, and covered up in the evening with about three inches thick of hay and mats. The plants were gone over and stopped, their leaves thinned, and the fruit in blossom set. At noon I watered all round the sides of the hills next to the flues, and then I laid

I laid some mould on the flues between each hill, and also a little round the sides of the hills to cover the roots of the plants. The linings, being sunk, were raised with hot dung.

Saturday, February 23, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	—	—	41	S.W. Thin clouds, and a brisk
8	78	86	42	S.W. Ditto. [wind.
10	75	86	47	S.W. Ditto.
11	83	86	50	S.W. The sun shines faintly.
12	84	86	50	S.W. Ditto.
2	80	86	49	S.W. Cloudy.
4	70	85	47	S.W. It rains a little.

The frames were uncovered about 8 o'clock in the morning, and covered up in the evening with about two inches thick of hay and mats. Air was given in the day-time, but the lights were shut down all the night.

Sunday, February 24, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	—	—	44	S.W. Thin clouds, nearly calm.
8	78	85	50	S.W. Ditto.
10	79	85	50	S.W. Ditto.
11	82	86	52	S.W. Cloudy, and nearly calm.
1	83	86	55	S.W. The sun glimmers.
2	82	86	54	S.W. Ditto.
4	80	86	49	S.W. Cloudy, gloomy.
5	76	85	48	S.W. Ditto.
8	—	—	46	S.W. Cloudy, and nearly calm.

The frames were uncovered about 8 o'clock in the morning, and covered up in the evening with about

about two inches thick of hay and mats. There was but little air admitted in the day-time, and less in the night. In the forenoon I went over the plants, and stopped them, thinned their leaves, and set the fruit in bloom. The linings were examined, and put close to the bed, and then a layer of fresh dung laid on the top of them.

Monday, February 25, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	—	—	44	S.W. Cloudy, and a brisk wind.
8	78	86	47	S.W. Ditto.
10	75	86	47	S.W. Ditto.
12	68	85	48	S.W. Ditto.
2	70	85	48	S.W. Cloudy and windy.
4	68	84	45	S.W. Ditto.

The frames were uncovered about half past 8 o'clock in the morning, and covered up in the evening with about four inches thick of hay and mats. In the forenoon I went over the plants, and stopped them, thinned their leaves, set the fruit that were in bloom, and where I found them too thick, I nipped off several showing fruit.

About 3 o'clock in the afternoon I got water about 85 degrees warm, and therewith I watered well the sides of the hills all round about, and I poured some on every part of the flues. I used about a hogshhead of water, and when the watering was finished, I had the lights shut down close till about 8 o'clock at night, when a little air was admitted at every light.

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Tuesday,

Tuesday, February 26, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	—	—	37	N.W. Windy, and some clouds.
8	76	84	39	N.W. Clear, and windy.
10	79	84	41	N.W. Ditto.
12	80	84	44	N.W. Sunshine, windy.
2	80	85	47	W. Ditto.
4	79	85	47	W. The wind is fallen.

The frames were uncovered about 8 o'clock in the morning, and covered up in the evening with about four inches thick of hay and mats. Air was given in the day-time, but the lights were shut close down all night. The plants were gone over, and stopped, their leaves thinned, and the fruit in blossom set.

Wednesday, February 27, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	—	—	40	S.W. Cloudy, and a brisk wind.
8	80	86	43	S.W. Ditto.
10	78	86	45	S.W. Cloudy and windy.
12	70	85	47	S.W. Ditto.
2	60	84	47	S.W. Ditto.
4	58	83	46	S.W. Ditto. [calm.
8	—	—	40	S.W. Clouds in the horizon,

The frames were uncovered at 8 o'clock in the morning, and covered up in the evening with about five inches thick of hay and mats. In the forenoon I went over the plants, and stopped them, thinned their leaves, and set the fruit in blossom, and after that I took mould, and laid upon all the cross flues, and raised it on them as high as the mould of the hills, and by pressing it gently I made it nearly of an equal firmness

firmness with that in which the plants were growing. I also laid some mould all along the sides of the hills, leaving a vacancy only of about five inches between the mould and the sides of the frames on each side of the plants. This vacancy is left to let the heat arise freely from the side flues, to warm the air in the frames for the nourishment and growth of the plants. Likewise I laid a little fresh mould among the stems and roots of the plants. It was 4 o'clock before I had done; the lights were then shut down for the night.

Thursday, February 28, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	—	—	40	S.W. Cloudy, and but little wind.
8	78	85	41	S.W. A small misty rain falls.
10	70	85	44	S.W. Ditto.
12	83	85	45	S.W. Scattered clouds.
2	84	85	45	S.W. The sun shines. {calm.
4	80	86	44	S.W. Scattered clouds, near
5	77	86	40	S.W. Clouds here and there.
8	—	—	37	W. Clear and nearly calm.

The frames were uncovered about 8 o'clock in the morning, and covered up in the evening with about four inches thick of hay and mats. About noon I went over the plants, and stopped them, thinned their leaves, and set the fruit that were in blossom. In several parts of the frames the plants were hanging over the sides of the hills, and down on the flues; therefore I took bricks, and set them edgewise on the flues close against the sides of the frames, eight inches high above the flues. I then took plain tiles eleven

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inches

inches long, and laid the one end of them on the said bricks, and the other rested on the mould of the hills. This I did only here and there, where the plants had extended their shoots beyond the surface of the hills of mould; and where more tiles than one were required near each other, I left vacancies between them of about two inches, so that the warmth of the flues might not be hindered from rising freely; and as I proceeded I trained out carefully the vines of the plants on the tiles. The plants are in a vigorous fruitful state, and their leaves broad, some of them measuring nine and ten inches diameter.

Friday, March 1, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	—	—	40	S.W. Flying clouds, windy.
8	83	88	42	S.W. Ditto.
10	74	87	43	S.W. Ditto.
12	66	86	42	S.W. High wind, and a small
2	68	86	43	S.W. Ditto. [rain.
4	65	85	44	S.W. Ditto.
5	64	85	44	S.W. Ditto.

The frames were uncovered at 8 o'clock in the morning, and covered up in the evening with about three inches thick of hay and mats. Air was given in the day-time, and a little left all night at each light. The plants were gone over, and stopped, their leaves thinned, and the fruit in blossom set. At 5 o'clock in the evening water 80 degrees warm was poured on the flues, till it stood in pools here and there.

Saturday,

Saturday, March 2, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	—	—	40	S.W. Windy, and some clouds.
8	70	83	42	S.W. Ditto.
10	76	83	45	S.W. The sun shines faintly.
12	82	84	48	S.W. Ditto.
2	75	85	50	S.W. Cloudy, and windy.
4	68	84	49	S.W. Ditto.
5	64	83	48	S.W. Ditto.
8	—	—	48	S.W. Ditto.

The frames were uncovered between 8 and 9 o'clock in the morning, and covered up at 5 in the evening with three inches thick of hay and mats. In the forenoon I went over the plants, and stopped them, thinned their leaves, and set the fruit in blossom. Air was given now and then in the day-time, and a little left all the night at each light.

Sunday, March 3, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	—	—	35	W. Clear, and a high wind; the wind was very high last night.
8	62	81	37	W. Clear, and a high wind.
10	74	81	41	W. Sunshine, windy.
11	80	82	43	W. Scattered clouds, windy.
1	82	83	45	W. Ditto.
4	71	84	42	W. A shower of hail.
5	68	84	41	W. Cloudy, and windy.
9	—	—	36	W. Clear, and windy.

The frames were uncovered about 8 o'clock in the morning, and covered up in the evening with

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three

three inches thick of hay and mats. Air was given in the middle of the day, and the lights were shut close down all night.

Monday, March 4, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	—	—	29	W. Clear, and a brisk gale of [wind.
8	75	84	31	W. Ditto.
10	76	84	35	W. Sunshine.
12	85	85	40	W. Scattered great clouds.
2	82	85	43	W. Ditto.
4	75	85	42	W. A heavy shower of hail.
5	68	85	40	W. Great black clouds.
7	—	—	35	W. Clear, and near calm.

The frames were uncovered about 8 o'clock in the morning, and covered up in the evening with about four inches thick of hay and mats. In the forenoon I went over the plants, and stopped them, thinned their leaves, and set the fruit in bloom.

At 4 o'clock I took water about 85 degrees warm, and poured it plentifully on the flues, and then shut the lights close down. The plants are very vigorous, and their roots appear thick all over the surface of the mould, and are matted close to the flues, and where the bare parts of the flues are moist, there the roots are run upon them.

Tuesday,

Tuesday, March 5, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	—	—	30	S. E. Thin clouds, but little
8	78	85	33	S. E. Ditto. [wind.
10	78	85	37	S. E. Ditto.
12	85	85	43	S. E. The sun shines faintly.
2	82	86	45	S. E. Ditto.
4	80	86	44	S. E. Cloudy, and a brisk wind.
5	78	86	43	S. E. Ditto.
8	—	—	40	S. E. Ditto.

The frames were uncovered about 8 o'clock in the morning, and covered up about half past 5 with four inches thick of hay and mats. At noon I went over the plants, and stopped them, thinned their leaves, set the fruit in blossom, and nipped off the weakest of the showing fruit where they were too thick. Air was given at 10 o'clock in the morning, and continued till between 3 and 4 in the afternoon, when I poured some water on the flues and against the sides of the frames, and then shut the lights down for the night.

Wednesday, March 6, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	—	—	34	E. Cloudy, and near calm.
8	78	85	37	E. Ditto.
10	80	85	42	E. The sun glimpses.
12	88	86	48	N. E. Scattered clouds.
2	80	86	47	N. E. Cloudy.
4	73	86	41	N. E. A shower of hail at 3 o'clock
5	69	86	40	N. E. Clouds near the horizon.
7	—	—	35	N. E. Clear, and a brisk wind.

The frames were uncovered about 8 o'clock in the morning,

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morning, and covered up a little past five with four inches thick of hay and mats. At noon I went over the plants, and stopped them, thinned their leaves, and set the fruit in blossom. Air was given now and then in the day-time, and a little left at each light all night.

Thursday, March 7, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	—	—	31	N. E. Cloudy, and but little wind.
9	75	85	35	N. E. Cloudy and gloomy.
10	72	84	39	N. E. Ditto.
12	76	84	45	N. E. The sun glimpses.
2	80	84	44	N. E. Ditto.
4	73	84	40	N. E. Cloudy, and a brisk wind.
5	70	84	38	N. E. Ditto.
8	—	—	36	N. E. Ditto.

The frames were uncovered about 9 o'clock in the morning, and covered up in the evening with about four inches thick of hay and mats. The plants were gone over, and stopped, their leaves thinned, the fruit in bloom set, and several showing fruit nipped off. But little air was given in the day-time, and at 4 o'clock the lights were shut close down for the night,

Friday,

Friday, March 8, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	—	—	34	N. E. Cloudy and cold.
9	72	83	36	N. E. Scattered clouds.
10	78	83	37	N. E. Sunshine, windy.
12	85	84	39	N. E. Ditto.
2	84	85	40	N. E. Ditto.
4	80	85	37	N. E. Ditto.
5	70	85	35	N. E. Ditto.
7	—	—	30	N. E. Clear and windy.

The frames were uncovered just before 9 o'clock, and covered up in the evening with about 3 inches thick of hay and mats. In the forenoon I went over the plants and stopped them, thinned their leaves, and set the fruit in blossom. Air was given at 10 o'clock, and continued till between 3 and 4, when it was taken away for the night.

Saturday, March 9, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	—	—	30	E. Cloudy and a brisk gale of
9	74	83	35	E. Ditto. [wind.
10	75	83	38	E. Scattered clouds.
12	90	85	41	E. Sunshine.
2	80	85	41	E. Ditto.
4	77	85	38	E. Ditto.
5	70	85	35	E. Clear, and a brisk wind.

The frames were uncovered about 9 o'clock in the morning, and covered up in the evening with about three inches thick of hay and mats. The plants were gone over and stopped, their leaves thinned, the fruit in blossom set, and the weeds picked out of the mould

mould among the plants. Air was continued all day, and a little left at each light during the night.

Sunday, March 10, 1793.

Hours. S.Th. P.Th. Ther. Wind.

6	—	—	24	E. Clear and calm.
8	70	82	23	E. Ditto.
10	72	82	33	E. Sunshine.
11	77	83	38	E. Ditto.
1	75	84	40	E. Ditto.
2	74	84	39	E. The air is overcast.
5	70	84	35	E. Cloudy and windy.

The frames were uncovered about 8 o'clock in the morning, and covered up in the evening with hay and mats. Air was given in the day-time, and some left all night.

Monday, March 11, 1793.

Hours. S.Th. P.Th. Ther. Wind.

6	—	—	31	E. Cloudy, windy, cold.
8	—	—	33	E. Ditto.
10	68	80	34	E. Ditto.
11	66	80	35	E. Ditto.
12	67	79	36	E. Ditto.
1	68	79	36	E. Ditto.
2	65	79	35	E. Ditto.
4	63	79	34	E. Ditto.
5	62	79	33	E. Ditto.

The frames were uncovered a little before 10 o'clock, and covered up at five in the evening with about five inches thick of hay and mats: At noon I went over the plants and stopped them, thinned their leaves, and set the fruit in blossom. The linings were

were raised higher than the mould in the frames with fresh dung. The lights were kept shut down as close as possible all the day, and remained so during the night.

Tuesday, March 12, 1793.

Hours. S.Th. P.Th. Ther. Wind.

6	—	—	30	E. Cloudy, windy, and cold.
9	70	79	32	E. Ditto.
10	70	79	33	E. Scattered clouds, windy.
12	80	80	35	E. Sunshine, windy.
2	87	82	36	E. Ditto.
4	86	82	35	E. Ditto.
5	84	82	33	E. Ditto.
6	—	—	30	E. Clear, the wind fallen.

The frames were uncovered about 9 o'clock in the morning, and covered up at 5 in the evening with four inches thick of hay and mats. I went over the plants and stopped them, thinned their leaves, and set those fruit that were in bloom. Air was given at 10 o'clock in the morning, and remained till 4 in the afternoon, when the lights were shut down for the night.

Wednesday, March 13, 1793.

Hours. S.Th. P.Th. Ther. Wind.

6	—	—	20	S. Cloudy; there had been rain in the night.
8	78	82	45	S.W. Cloudy, and a brisk wind.
9	76	82	47	S.W. Ditto.
10	72	82	48	S.W. Ditto.
12	78	82	53	S.W. Ditto.
4	78	83	52	S.W. Ditto.
5	72	82	48	S.W. Ditto.

The frames were uncovered about 8 o'clock in the

the morning, and covered up in the evening with about four inches thick of hay and mats. Air was admitted at 9 o'clock, and continued all day, and a little left all night at each light. In the forenoon I went over the plants and stopped them, thinned their leaves, and set the fruit in blossom.

Thursday, March 14, 1793.

Hours.	S.	Th.	P.	Th.	Ther.	Wind.
6	—	—	—	—	39	S. Cloudy and near calm.
8	79	83	—	—	43	S. Ditto.
10	82	83	—	—	50	S. The sun glimmers.
11	88	84	—	—	53	S.W. Ditto.
22	83	85	—	—	55	S.W. Ditto.
2	88	85	—	—	53	S.W. Ditto.
3	88	85	—	—	52	S.W. Sunshine.
4	85	85	—	—	50	S.W. Clouds here and there.
7	—	—	—	—	43	S.W. Clear, and nearly calm.

Hours.	S.	Th.	P.	Th.	Ther.	Wind.
6	—	—	—	—	39	S. Cloudy and near calm.
8	79	83	—	—	43	S. Ditto.
10	82	83	—	—	50	S. The sun glimmers.
11	88	84	—	—	53	S.W. Ditto.
22	83	85	—	—	55	S.W. Ditto.
2	88	85	—	—	53	S.W. Ditto.
3	88	85	—	—	52	S.W. Sunshine.
4	85	85	—	—	50	S.W. Clouds here and there.
7	—	—	—	—	43	S.W. Clear, and nearly calm.

The frames were uncovered about 8 o'clock in the morning, and covered in the evening with about two inches thick of hay and mats. In the morning I went over the plants and stopped them, thinned their leaves, and set the fruit in blossom. Between 11 and 12 o'clock I watered the plants, with water eighty-five degrees warm; in doing which I first poured some of it on the mould next and close to the flues, and then poured it all over the plants and every part of the frames, out of a watering-pot with a rose on its spout; I gave them about a hog-head of water, and immediately shut the lights down for about a quarter of an hour.

Friday,

Friday, March 15, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	—	—	29	S.W. Clear and near calm.
8	79	85	35	S.W. Ditto.
10	88	86	41	S.W. Sunshine.
12	89	86	48	W. Ditto.
2	87	87	52	W. Ditto.
3	77	87	48	W. The air is overcast.
4	74	87	47	W. Cloudy, and but little wind.
5	72	86	47	W. Ditto.

The frames were uncovered about 8 o'clock in the morning, and covered up in the evening with about two inches thick of hay and mats. The plants were gone over and stopped, their leaves thinned, the weeds picked out, and the fruit in blossom set. Air was given plentifully in the day-time, and a little left all night at each light.

Saturday, March 16, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	—	—	39	S. Thin clouds; nearly calm.
8	84	86	44	S. Cloudy, and a brisk wind.
10	85	86	47	S. Cloudy and windy.
12	85	87	52	S.W. Ditto.
3	78	87	48	S.W. Ditto.
4	74	86	47	S.W. Ditto.
5	70	86	46	S.W. It begins to rain.

The frames were uncovered about 8 o'clock in the morning, and covered up in the evening with two inches thick of hay and mats. When the frames were uncovered I went over the plants and stopped them, thinned their leaves, and set the fruit that

that I found in bloffom. In the forenoon I poured water upon the flues on each side of the plants. Air was given day and night.

Sunday, March 17, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	—	—	29	S.W. Clear; there had been rain in the night.
8	74	83	35	S. Clouds here and there.
10	85	83	39	S. Sunshine.
11	85	83	42	S. E. Scattered clouds.
1	83	84	46	S. E. Ditto.
2	77	84	45	S. E. Cloudy, and a brisk wind.
4	75	84	42	S. E. It looks rainy.
5	—	—	41	S. E. It rains.

The frames were uncovered about 8 o'clock in the morning, and covered up in the evening with about three inches thick of hay and mats. Plenty of air was admitted in the day-time, but the lights were shut clofe down all night.

Monday, March 18, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	—	—	40	S. E. Cloudy; there had been a good deal of rain in the night.
8	75	82	44	S. E. Scattered clouds.
10	80	82	48	S. E. The sun glimpses.
12	80	83	51	S. Sunshine.
1	89	84	51	S.W. Ditto.
2	78	84	50	S.W. Cloudy.
4	72	84	47	S.W. It rains.
5	70	83	40	W. Ditto.
8	—	—	30	N.W. Cloudy, and a brisk wind.

The frames were uncovered at 8 o'clock in the morning,

morning, and covered up in the evening with about three inches thick of hay and mats. In the forenoon I went over the plants and stopped them, thinned their leaves, and set the fruit in blossom. Air was admitted from 10 o'clock in the morning till 4 in the afternoon, when the lights were shut down for the night.

Tuesday, March 19, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	—	—	34	S.W. Cloudy, and near calm.
8	72	82	37	S.W. Ditto.
10	77	82	39	S.W. Ditto.
12	70	82	45	S.W. Ditto.
2	79	82	49	W. Scattered clouds.
4	82	83	48	W. Sunshine.
5	80	83	46	W. Ditto.
8	—	—	36	W. Clear, and nearly calm.

The frames were uncovered at 8 o'clock in the morning, and covered up in the evening with about four inches thick of hay and mats. At 10 o'clock I went over the plants and stopped them, thinned their leaves, and set the fruit in blossom.

To-day I had the north-side lining renewed, in doing which the unexhausted dung of it was laid aside, and the rotten exhausted part of it wheeled away, leaving about nine or ten inches of the foundation unremoved, and which I had loosened up with the dung-forks, and then the unexhausted dung that was laid aside was well shaken and laid upon it, making the lining of an equal height therewith; when that was done, the lining was finished with new dung, and

and it was raised higher up the sides of the frames than the mould in the inside of them.

Wednesday, March 20, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	—	—	39	S.W. Cloudy, and but little wind.
8	70	80	44	S.W. Ditto.
10	76	80	48	S.W. The sun glimmers.
12	75	81	56	S.W. Ditto.
2	77	81	57	S.W. Cloudy.
4	75	81	53	S.W. Ditto.
5	72	81	50	S.W. Gloomy.
7	—	—	46	S.W. Cloudy, and nearly calm.

The frames were uncovered about 8 o'clock in the morning, and covered up in the evening with about two inches thick of hay and mats. Air was given at 10 o'clock, and continued till 5 in the evening; when it was taken away for the night. The plants were stopped, their leaves thinned, and the fruit in blossom set.

Thursday, March 21, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	—	—	40	S.W. It rains lightly.
8	76	82	46	S.W. Cloudy and gloomy.
10	72	82	48	S.W. It rains gently.
12	74	82	51	S.W. Ditto.
2	74	82	50	S.W. Ditto.
5	72	82	47	S.W. Cloudy, and nearly calm.
8	—	—	39	S.W. Clear and calm.

The frames were uncovered about 8 o'clock in the morning, and covered up in the evening with about two inches thick of hay and mats. I went over the plants and stopped them, thinned their leaves, and set the

the fruit that I found in bloom. The north-side lining being sunk, was raised with new dung.

Friday, March 22, 1793.

Hours. S.Th. P.Th. Ther. Wind.

6	—	—	38	S. Cloudy, red before sun-rising.
8	76	83	42	S. Cloudy, and a brisk wind.
10	74	83	44	S. It rains.
11	75	83	46	S. Ditto.
12	70	83	46	S. Ditto.
2	68	83	45	S. Ditto.
3	67	83	44	S. Fair, cloudy.
4	69	83	44	S. Showery.
8	—	—	42	S. Ditto.

The frames were uncovered at 8 o'clock in the morning, and covered up in the evening with about three inches thick of hay and mats. The plants were gone over and stopped, their leaves thinned, and the fruit in blossom set. Air was not admitted till 11 o'clock. At 4 o'clock in the afternoon I poured cold water on the flues, and then shut the lights close down for the night.

Saturday, March 23, 1793.

Hours. S.Th. P.Th. Ther. Wind.

6	—	—	31	W. Clear, and a brisk wind.
8	79	84	34	W. Ditto.
10	82	84	48	W. Sunshine.
12	88	85	51	S.W. Ditto.
2	86	85	51	S. Ditto.
4	78	86	46	S. Ditto.
6	—	—	37	S. Clouds here and there.

The frames were uncovered about 8 o'clock in the
M morning,

morning, and covered up at 5 in the evening with about three inches thick of hay and mats. In the forenoon I went over the plants and stopped them, thinned their leaves, and set the fruit in blossom. Air was given at 10 o'clock in the morning, and continued all day, and a little left at each light all night.

Sunday, March 24, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	—	—	30	E. Clear, and a brisk gale of wind.
8	70	83	35	N. E. Scattered clouds, windy.
10	70	83	37	N. E. Cloudy and windy.
1	63	82	38	N. E. It rains lightly.
2	65	82	38	N. E. Ditto.
4	62	82	37	N. E. Cloudy and windy.

The frames were uncovered between 8 and 9 o'clock in the morning, and covered up about 5 in the evening with about four inches thick of hay and mats.

Monday, March 25, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	—	—	34	N. E. It is a cold wet morning.
9	70	82	37	N. E. Ditto.
10	68	82	40	N. E. Fair, cloudy, windy.
12	74	82	42	N. E. Ditto.
2	70	82	41	N. E. Ditto.
4	68	82	39	N. E. Ditto.
8	—	—	36	N. E. Ditto.

The frames were uncovered at 9 o'clock in the morning, and covered up in the evening with about four inches thick of hay and mats. I went over the plants and stopped them, thinned their leaves, and set the

the fruit in blossom. The linings being sunk, were raised with new dung. But little air was given in the day-time, and the lights were shut close down all night.

Tuesday, March 26, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	—	—	30	N. E. Rainy and windy.
7	—	—	30	N. E. A heavy fall of wet snow.
10	74	83	34	N. E. Windy, cold, and rainy.
12	67	82	35	N. E. Cloudy, windy, cold.
1	63	82	35	N. E. Ditto.
2	64	81	35	N. E. Ditto.
4	65	81	35	N. E. Ditto.
8	—	—	33	N. E. Clear, and windy.

The frames were uncovered a little before 10 o'clock in the morning, and covered up at 5 in the afternoon with about five inches thick of hay and mats. Air was admitted for two hours in the middle of the day, and the lights were kept close shut down all night.

Wednesday, March 27, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	—	—	30	N. E. Cloudy, cold, and windy.
9	72	83	33	N. E. Ditto.
10	70	83	35	N. E. Ditto.
12	70	83	38	N. E. Ditto.
2	80	83	38	N. E. The sun glimpses.
4	74	84	36	N. E. The wind is fallen.
8	—	—	31	N. E. Cloudy, and a brisk wind.

The frames were uncovered at 9 o'clock in the morning, and covered up in the evening with about five inches thick of hay and mats. At noon I went over the plants and stopped them, thinned their leaves,

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and

and set the fruit in blossom. But little air was given in the day-time, and the lights were shut close down all night.

Thursday, March 28, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.	
6	—	—	29	N. E.	The earth is covered with snow, and snow continues to fall.
8	76	84	32	N. E.	Sunshine, near calm.
9	78	84	33	N. E.	Scattered clouds.
10	81	85	38	N. E.	Ditto.
12	81	85	40	N. E.	Cloudy, and a little snow
2	87	86	39	N. E.	Sunshine. [falls.
3	87	86	38	N. E.	Ditto.
4	84	87	36	N. E.	Ditto.
9	—	—	24	N. E.	Clear and calm.
10	—	—	23	N. E.	Ditto.

The frames were uncovered about 8 o'clock in the morning, and covered up a little before 6 in the evening with about five inches thick of hay and mats. Air was admitted at 10 o'clock in the morning, and taken away at 5 o'clock in the afternoon. The linings were raised with dung fresh from the stables. In the forenoon the plants were gone over and stopped, their leaves thinned, the weeds picked out, and the fruit in blossom were set.

Friday,

Friday, March 29, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	—	—	26	N. E. Cloudy.
9	80	87	37	N. E. The sun glimmers.
10	87	87	40	N. E. Ditto.
12	88	88	43	E. Sunshine.
2	84	89	44	E. Ditto.
4	80	89	42	E. Clouds here and there.
8	—	—	29	E. Clear and calm.
10	—	—	25	E. Ditto.

The frames were uncovered about 9 nine o'clock in the morning, and covered up in the evening with about four inches thick of hay and mats. About noon I went over the plants and stopped them, thinned their leaves, and set the fruit that I found in bloom: I then took water eighty degrees warm, and poured plenty of it on the flues, and on the mould next to the flues.

Saturday, March 30, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	—	—	23	N. E. Clear and nearly calm.
8	80	87	28	N. E. Ditto.
9	82	87	32	N. E. Sunshine.
10	90	88	35	N. E. Ditto.
11	87	89	39	N. E. Ditto.
12	86	90	42	N. E. Ditto.
1	90	90	43	N. E. Ditto.
2	87	90	44	N. E. Ditto.
4	79	90	45	N. E. Scattered clouds.
5	82	90	42	N. E. Ditto.

The frames were uncovered at 8 o'clock in the morning, and covered up in the evening with about

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four

four inches thick of hay and mats. As soon as the frames were uncovered, I went over the plants and stopped them, thinned their leaves, and set the fruit in blossom. Air was given all day, but the lights were shut down all night.

Sunday, March 31, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	—	—	25	N. E. Clear and calm.
8	82	89	30	N. E. Ditto.
10	90	90	37	N. E. Sunshine.
1	87	91	42	N. E. The sun shines faintly.
2	93	92	44	N. W. Sunshine.
4	78	92	42	N. W. Some clouds, but little wind.
5	82	92	38	N. W. Ditto, and the sky looks
6	—	—	36	W. Ditto. [frosty.
10	—	—	34	W. Cloudy.

The frames were uncovered at 8 o'clock in the morning, and covered up in the evening with about three inches thick of hay and mats. Air was admitted plentifully in the day-time, and a little left all night at each light.

Monday, April 1, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	—	—	34	S. It snows.
9	78	90	36	S. Snow continues to fall.
10	74	90	37	S. E. Sleety, snow falls.
12	68	89	37	S. E. It rains.
2	68	88	37	S. E. Ditto.
3	66	87	37	S. E. Ditto.
4	65	87	37	S. E. Ditto.
6	—	—	36	S. E. Gloomy, and a thick moist atmosphere.

The frames were uncovered about 9 o'clock in the morning.

morning, and covered up about 5 in the evening with about five inches thick of hay and mats. About noon I went over the plants and stopped them, and set the fruit that I found in blossom. The lights were kept shut down as close as possible all day, and remained so all night. The north-side lining was raised with fresh dung.

Tuesday, April 2, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	—	—	31	W. The earth is covered with snow, and snow continues falling.
7	—	—	32	W. A heavy fall of wet snow.
9	—	—	34	N.W. It rains.
10	75	87	37	N.W. Fair and cloudy.
12	73	87	39	N.W. Ditto.
2	68	86	38	W. Cloudy, and a brisk wind.
4	67	86	37	W. Ditto.
5	66	85	37	W. Ditto.
8	—	—	36	W. Cloudy and dark.

The frames were uncovered a little before 10 o'clock in the morning, and covered up in the evening with about five inches thick of hay and mats. The plants were gone over and stopped, their leaves thinned, and the fruit in blossom set. A little air was admitted in the middle of the day, but the lights were shut close down all night.

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Wednesday,

Wednesday, April 3, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	—	—	29	W. Clear, and but little wind.
8	78	86	34	S.W. Sunshine.
10	82	86	40	S.W. Ditto.
11	83	86	47	S.W. Scattered clouds.
12	76	87	49	S.W. Ditto.
1	77	88	49	S.W. Ditto.
3	81	88	48	S.W. Ditto.
5	82	88	42	S.W. Clouds here and there.

The frames were uncovered about 8 o'clock in the morning, and covered up at 5 in the afternoon with about four inches thick of hay and mats. In the morning I went over the plants and stopped them, thinned their leaves, and set the fruit in blossom. Air was admitted plentifully in the day-time, but the lights were shut close down all night.

Thursday, April 4, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	—	—	33	N.E. Thin clouds, near calm.
8	82	89	38	N.E. Ditto.
10	88	90	48	N.E. The sun glimmers.
12	84	90	50	N.E. Ditto.
2	82	90	52	N.E. Scattered clouds.
4	80	90	48	N.E. Ditto.
6	—	—	44	N.W. The sun looks very red, and the sky frosty.
9	—	—	39	N.E. The stars appear faintly, nearly calm.

The frames were uncovered a little past 8 in the morning, and covered up at 5 in the evening with near
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four

four inches thick of hay and mats. Air was given at 9 o'clock in the morning, and continued till about 4 in the afternoon, when the lights were shut down for the night. About noon the plants were gone over and stopped, their leaves thinned, and the fruit in blossom set. When that was done I gave the plants a hearty watering with water about 82 degrees warm; most water was given to the mould next to the flues, and some was poured on the flues.

Friday, April 5, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	—	—	36	N. E. Cloudy, and but little wind.
8	83	90	44	N. E. Sunshine.
10	88	91	46	N. E. Ditto.
12	88	92	50	N. E. Ditto.
1	91	92	53	N. E. Ditto.
2	89	92	53	N. E. Ditto.
3	86	93	54	N. E. Ditto.
4	82	91	52	N. E. Ditto.
9	—	—	38	N. E. Clear, and nearly calm.

The frames were uncovered at 8 o'clock in the morning, and covered up between 5 and 6 in the afternoon with about four inches thick of hay and mats. In the morning the plants were gone over and stopped, their leaves thinned, the weeds picked out, and the fruit in bloom set. Air was given about 9 o'clock in the morning, and taken away about 4 in the afternoon.

Saturday,

Saturday, April 6, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	—	—	37	N. E. Foggy.
9	82	91	40	N. E. Ditto.
10	87	92	45	N. E. The sun glimmers.
11	90	92	46	N. E. Ditto.
12	87	92	47	N. E. Sunshine.
2	90	92	52	E. Ditto.
4	80	92	50	E. Ditto.
9	—	—	35	E. Clear, and near calm.

The frames were uncovered about 9 o'clock in the morning, and covered up in the evening with about three inches thick of hay and mats. In the morning I went over the plants and stopped them, thinned their leaves, and set the fruit in blossom. Air was admitted at 9 o'clock in the morning, and continued all day, and a little left all night at every light.

Sunday, April 7, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	—	—	30	E. Clear, and a brisk wind.
8	79	89	39	E. Ditto.
10	92	90	48	E. Bright sunshine.
1	87	92	50	E. Ditto.
3	84	92	49	E. Ditto.
4	80	92	47	E. Ditto.
7	—	—	39	E. Clear, and a brisk wind.

The frames were uncovered about 8 o'clock in the morning, and covered at 5 in the evening with three inches thick of hay and mats. Plenty of air was given in the day-time, and a little was left during the night.

Monday,

Monday, April 8, 1793.

Hours. S.Th. P.Th. Ther. Wind.

6	—	—	30	E. Clear, the frost white.
8	78	89	39	E. Sunshine, and a brisk gale
10	82	89	43	E. Ditto. [of wind.
12	80	89	48	E. Ditto.
2	80	90	46	E. Ditto.
5	78	89	43	E. Ditto. wind.
8	—	—	32	E. Clear, and a brisk gale of

The frames were uncovered at 8 o'clock in the morning, and covered up in the evening about 6 o'clock with three inches thick of hay and mats. In the day-time air was admitted plentifully, and a little left all night at each light. In the morning I went over the plants and stopped them, thinned their leaves, and set the fruit in bloom. At noon the flues were floated with water about 80 degrees warm, and the mould near the flues was watered.

Tuesday, April 9, 1793.

Hours. S.Th. P.Th. Ther. Wind.

6	—	—	28	E. Clear, and a brisk wind.
8	79	88	38	E. Sunshine, windy.
10	85	89	42	E. Ditto.
12	87	90	48	E. Scattered clouds, windy.
2	88	91	47	E. Ditto.
4	85	91	42	E. Ditto.

The frames were uncovered at 8 o'clock in the morning, and covered at 5 in the evening with about three inches thick of hay and mats. The plants were gone over and stopped, their leaves thinned,

thinned, the fruit in bloom set, and the weeds picked out. Air was admitted plentifully from 9 in the morning till 4 in the afternoon, when the lights were shut down for the night.

To-day at noon I held the thermometer in the water in the pond, and it stood at 46, and when held in the water in the spring, it stood at 45; and a thermometer, with its bulb six inches deep in the earth on a north wall border, stood at 39.

Wednesday, April 10, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	—	—	29	N. E. Clear, and near calm.
8	82	90	37	N. E. Clouds here and there, windy.
10	83	90	43	N. E. Scattered great snowy-
11	80	90	43	N. E. Ditto. [like clouds.
12	80	90	44	N. E. Cloudy, and windy.
2	75	90	44	N. E. Ditto.
5	76	89	43	N. E. Scattered clouds, which look snowy.
8	—	—	36	N. E. Clear, and a brisk gale of wind.

The frames were uncovered about 8 o'clock in the morning, and covered up between 5 and 6 in the afternoon with about four inches thick of hay and mats. The plants were gone over and stopped, their leaves thinned, and the fruit in blossom set. Air was given from 10 in the morning till 4 in the afternoon, and then the lights were shut close down.

Thursday,

Thursday, April 11, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
5	—	—	27	N. E. Thin streaky clouds.
6	—	—	28	N.W. Cloudy.
8	78	88	36	W. Ditto.
10	73	87	36	N.W. Snow falls.
12	75	87	41	N.W. Cloudy, and a brisk wind.
1	76	87	41	W. Ditto.
2	77	87	41	N. Showery.
4	76	83	42	N. E. Cloudy, and a brisk gale
6	—	—	39	N. E. Ditto. [of wind.

The frames were uncovered about 8 o'clock in the morning, and covered up in the evening between 5 and 6 with about four inches thick of hay and mats. In the forenoon I stopped the plants, thinned their leaves, and set the fruit in blossom; and about 3 o'clock in the afternoon I gave to each three-light frame about half a hoghead of water warmed, till it raised the thermometer to 82 degrees; and in giving the water, the lights were taken off one at a time, and the water poured all over the plants, flues, and sides of the frames out of water-pots with roses on them, in imitation of a heavy shower of rain. When the watering was finished, the lights were shut down for the night.

Friday

Friday, April 12, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	—	—	34	N. E. Cloudy; snow had fallen in the night.
8	78	35	36	N. E. Cloudy, and a brisk wind.
10	75	85	37	N. E. It rains lightly.
12	78	85	43	N. E. Cloudy.
2	72	85	41	N. E. Ditto.
4	72	85	42	N. E. Ditto.
10	—	—	35	N. E. Clear, and near calm.

The frames were uncovered about 8 o'clock in the morning, and covered up in the evening with about three inches thick of hay and mats. The plants were stopped, their leaves thinned, and the fruit in bloom set. Air was given but for one hour, and that was from 1 to 2 o'clock.

Saturday, April 13, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	—	—	29	N. E. White frost, and a thick fog.
8	79	86	37	N. E. The sun shines faintly.
10	90	87	42	N. E. Sunshine.
11	88	87	44	N. E. Ditto.
1	93	90	48	N. E. Ditto.
3	96	91	52	N. E. Ditto.
5	90	90	52	N. E. Ditto.
10	—	—	46	N. E. Clouds here and there.

The frames were uncovered about 8 o'clock in the morning, and covered up in the afternoon about 5 with about three inches thick of hay and mats. In the morning I went over the plants and stopped them,

them, thinned their leaves, and set the fruit that I found in blossom. Air was given plentifully in the day-time, but the lights were shut close down all night.

Sunday, April 14, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	—	—	40	N. E. Sunshine.
8	81	90	42	N. E. Some clouds.
10	78	90	42	W. Cloudy, and a cold wind.
11	82	90	42	N.W. Ditto.
1	82	90	42	N. Ditto.
2	80	90	40	N. E. The sun glimpses.
4	76	90	41	N. E. Ditto.
10	—	—	32	N. E. Clear, and a brisk wind.

The frames were uncovered about 8 o'clock in the morning, and covered up about 5 in the afternoon with three inches thick of hay and mats. Air was admitted at 9 o'clock, and continued all day, and a little left at each light all night.

Monday, April 15, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	—	—	28	S.W. Streaky clouds, and a brisk wind.
8	67	85	36	S.W. Clouds here and there.
10	75	85	45	S.W. Sunshine, windy.
12	75	85	48	S.W. Cloudy and windy.
2	64	85	49	S.W. Ditto.
4	66	85	47	S.W. Ditto.
9	—	—	42	S.W. Cloudy, dark, windy.

The frames were uncovered in the morning about 8 o'clock,

8 o'clock, and covered up at 5 in the afternoon with about three inches thick of hay and mats. As soon as uncovered I went over the plants and stopped them, thinned their leaves, and set the fruit in blossom. Air was continued day and night.

Tuesday, April 16, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.	
6	—	—	33	N.	Great snowy clouds all over the air.
8	—	—	33	N.	Some snow falls.
9	72	84	35	N.	Ditto.
10	75	84	37	N.W.	Scattered clouds.
11	88	85	38	N.W.	Large towering clouds, and showers of snow.
12	89	85	40	N.W.	Sunshine.
2	79	85	38	N.W.	Showers of snow.
4	72	85	37	N.W.	Ditto.
8	—	—	29	N.W.	Clear, and but little wind.

The frames were uncovered just before 9 in the morning, and covered about 5 o'clock in the afternoon with about four inches thick of hay and mats. At 2 o'clock I went over the plants and stopped them, thinned their leaves, and set the fruit that were in blossom. When that was done, I took water about 80 degrees warm, and poured some of it on the flues, and some on the mould next to the flues. Air was continued all day, and a little left at each light all night.

Wednesday

Wednesday, April 17, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	—	—	28	S.W. Clear, and a hoar frost.
8	72	82	32	S.W. Sunshine.
10	77	83	45	S.W. The sun shines faintly.
12	76	83	48	S.W. The sky is overcast with lofty foggy clouds, and the sun appears faintly.
2	68	82	40	S.W. It rains lightly.
3	65	82	38	S.W. Ditto.
4	64	82	37	S.W. Windy, and it continues raining.
6	—	—	35	S. High wind, and it rains.

The frames were uncovered about 8 o'clock in the morning, and covered up about 5 in the evening with about three inches thick of hay and mats. About noon I went over the plants and stopped them, thinned out some of the oldest leaves, picked off the showing fruit where too thick, and set those in blossom. Air was continued till near 4 in the afternoon, when the lights were shut down, and remained so all night.

Thursday, April 18, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	—	—	44	S.W. Windy, and a small rain.
8	70	80	48	S.W. Cloudy and windy.
10	72	80	50	S.W. Ditto.
12	74	81	53	S.W. Showery, windy.
2	70	81	53	S.W. Ditto.
3	71	81	53	S.W. Great clouds, stormy.
5	74	81	48	S.W. The sun shines, and it rains.
7	—	—	44	S.W. Great showery clouds.
9	—	—	44	S.W. Heavy showers.

The frames were uncovered about half past 8
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in the morning, and covered up about 5 in the afternoon with three inches thick of hay and mats. At noon the plants were stopped, their leaves thinned, and the fruit in blossom set. The north side lining was raised with new dung. But little air was given in the day-time, and less during the night.

Friday, April 19, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	—	—	36	N.W. Cloudy, and a cold wind.
9	75	82	40	N.W. Ditto. [clouds.
10	73	82	41	N.W. Great towering snowy
11	81	82	38	N.W. A heavy shower of hail.
1	76	82	37	N.W. Gusts of wind, and show-
2	75	82	38	N.W. Ditto. [ers of hail.
4	70	83	37	N. Great frosty-like clouds.
7	—	—	32	N. Clear, and but little wind.
9	—	—	29	N. Ditto.

The frames were uncovered at 9 in the morning, and covered up between 4 and 5 o'clock in the afternoon with about three inches thick of hay and mats. Air was admitted day and night. In the forenoon I stopped the plants, thinned their leaves, and set the fruit that I found in bloom.

Saturday, April 20, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	—	—	27	W. Thin clouds in the hori-
8	72	81	32	W. Sunshine. [zon.
10	87	82	42	N. Scattered clouds, near
12	86	84	46	N.E. Ditto. [calm.
1	87	85	48	N.E. Sunshine.
4	85	85	47	N.E. Clouds here and there.
6	—	—	40	N.E. Clear, and nearly calm.

The frames were uncovered about 8 o'clock in the

the morning, and covered up about 5 in the afternoon with hay and mats. In the morning the plants were stopped, their leaves thinned, and the fruit in blossom set. Plenty of air was given in the daytime, and the lights were shut close down all night.

Sunday, April 21, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	—	—	40	S. Thin streaky clouds.
8	78	85	47	S. Ditto.
10	81	85	49	S. The sun shines faintly.
11	88	85	53	S.W. Ditto.
1	90	86	55	S.W. Sunshine.
2	82	86	54	S.W. Ditto.
4	86	86	53	S.W. Ditto.
9	—	—	39	S. E. Clear.

The frames were uncovered about 8 o'clock in the morning, and covered up a little before 6 in the evening with double mats. Air was admitted in the daytime plentifully, and a little left all night.

Monday, April 22, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
5	—	—	34	S. E. The air is overcast with thin clouds.
8	70	80	46	S. E. Sunshine.
10	82	81	51	S. E. Ditto.
12	84	84	55	S. E. The sun shines faintly.
2	86	85	55	S. E. Ditto.
4	80	84	54	S. E. Sunshine.
8	—	—	39	E. Clear and calm.

The frames were uncovered about half past 7 o'clock

in the morning, and covered at 5 in the afternoon with double mats. In the morning I went over the plants and stopped them, thinned their leaves, and set the fruit in blossom. In the afternoon the plants were watered moderately with water warmed to about 80 degrees. Air was admitted plentifully in the day-time, and a little left all night.

Tuesday, April 23, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
5	—	—	34	S. E. Clear, and a white frost.
6	—	—	40	S. E. Thin clouds near the hori-
7	72	80	47	S. E. Sunshine. [zon.
10	80	82	52	S. E. Ditto.
12	87	84	57	S. E. Ditto.
2	85	84	59	S. E. Ditto.
3	80	84	61	S. E. The sun shines faintly.
4	79	84	59	S. E. Ditto.
6	—	—	56	S. E. Ditto.
8	—	—	46	S. E. Thin high clouds and lower small black ones come slowly from the south-west.

The frames were uncovered at 7 o'clock in the morning, and covered about 6 in the evening with double mats. The plants were stopped, their leaves thinned, the weeds picked out, the fruit in blossom set, and where the fruit were showing too thick, the worst and weakest of them were nipped off. Air was admitted day and night.

Wednesday,

Wednesday, April 24, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	—	—	42	W. Cloudy.
8	75	81	50	W. Ditto.
10	90	83	57	W. The sun shines faintly.
12	84	84	62	N. Smoaky-like clouds all over the air.
2	82	84	61	N. The sun glimmers.
3	80	84	58	N. Great black clouds in the south-west, and it thunders.
4	75	83	55	N. E. Cloudy, and nearly calm.
8	—	—	44	N. E. Ditto.

The frames were uncovered about 8 o'clock in the morning, and covered up at 5 in the afternoon with double mats. In the morning the plants were stopped, their leaves thinned, and the fruit in bloom set. At four in the afternoon water was sprinkled all round the insides of the frames, and on the bare parts of the flues, and on the mould next to the flues. The lights were then shut down for the night.

Thursday, April 25, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	—	—	40	N. Cloudy and gloomy.
9	72	81	42	N. It rains lightly.
10	70	81	43	N. Ditto.
12	70	81	47	N. Gloomy.
2	77	81	42	N. Cloudy.
4	75	81	48	N. Ditto.
8	—	—	43	N. The moon shines faintly.

The frames were uncovered at 9 o'clock in the morning,
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morning, and covered up at 5 in the afternoon with double mats. The plants were stopped, their leaves thinned, and the fruit in blossom set. Air was given at 10 o'clock in the morning, and continued till 4 in the afternoon, when the lights were shut down for the night.

Friday, April 26, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.	
6	—	—	42	W.	Clouds here and there.
7	69	79	47	W.	Cloudy.
10	84	79	60	W.	The sun glimpses.
12	82	80	62	W.	Ditto.
2	75	81	61	W.	Ditto.
3	79	81	58	S.W.	Ditto.
6	72	81	53	S.W.	Ditto.
8	—	—	44	S.W.	Clouds in the horizon.

The frames were uncovered at 7 o'clock in the morning, and covered up at 6 in the afternoon with double mats. In the morning the plants were stopped, their leaves thinned, and the fruit in bloom set. Air was given plentifully till 4 o'clock. To-day I had a fresh lining applied to the south side of the bed. There was no heat in the old lining, it was therefore all wheeled away except a little dung which was lately laid on the top of it, and which was laid aside, and shaken into the foundation of the new lining. The new lining was made with dung taken from among the cow-cribs. To-day I began to cut melons.

Saturday,

Saturday, April 27, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind,
6	—	—	43	S. E. Cloudy, and but little
8	70	78	50	S. E. Ditto. [wind.
10	75	79	52	S. E. Cloudy, and a brisk wind.
12	75	79	57	S. E. Ditto.
2	77	80	56	S. E. Gloomy.
4	74	80	56	S. E. Cloudy, and a strong gale
6	—	—	48	S. E. Ditto. [of wind.

The frames were uncovered at 8 o'clock in the morning, and covered up about 5 in the afternoon with double mats. In the morning I stopped the plants, thinned their leaves, and set the fruit that I found in blossom. A little air was admitted in the day-time, and continued all night.

Sunday, April 28, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind,
6	—	—	40	N. E. Cloudy, and a cold wind,
8	70	77	45	N. E. Ditto.
10	79	78	49	N. E. Light clouds.
11	84	80	52	N. E. The sun shines faintly.
1	82	82	56	N. E. Scattered smoaky-like
3	80	81	58	N. E. Ditto. [clouds.
5	82	81	57	N. E. Sunshine.
8	—	—	42	N. E. Clear, and nearly calm.

The frames were uncovered about 8 o'clock in the morning, and covered up in the evening with mats. Air was admitted day and night.

Monday, April 29, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	—	—	36	S.W. Sunshine.
7	70	80	45	S.W. The sun shines faintly.
10	81	81	53	S.W. Thin clouds, and a brisk gale of wind.
12	78	81	53	S.W. Cloudy and windy.
2	70	81	53	S.W. Windy, and a small driv-
4	68	81	52	S.W. Ditto. [ing rain.
8	—	—	45	S.W. Clear, and a brisk wind.

The frames were uncovered at 7 o'clock in the morning, and covered between 5 and 6 in the afternoon with mats. In the morning I stopped the plants, thinned out some of their leaves, and set the fruit in blossom. The south side lining, being sunk, was raised with hot dung. Air was continued day and night.

Tuesday, April 30, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
5	—	—	38	S.W. Clear, and but little wind,
6	—	—	42	S.W. Ditto.
8	69	80	49	S.W. Flying clouds; the sun
10	80	81	55	S.W. Ditto. [glimmers.
12	80	83	59	S.W. Cloudy, it looks rainy.
3	77	83	58	S.W. Some drops of rain fall.
5	70	83	57	S. Windy, and some rain.
8	—	—	50	S. Ditto.

The frames were uncovered about 8 o'clock in the morning, and covered up about 5 in the afternoon with double mats. In the morning I stopped the plants, thinned their leaves, and set the fruit in blossom. Air was admitted in the day-time, but the lights were shut close down all night.

Wednesday,

Wednesday, May 1, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.	
5	—	—	45	W.	Flying clouds, wind high; there had been a fine rain in the night.
8	70	82	50	W.	Flying clouds, and light
10	77	83	55	W.	Ditto. [showers.
12	75	83	59	S.W.	Cloudy, windy.
2	77	83	58	S.W.	Ditto. [then.
4	70	84	55	S.W.	The sun shines now and
6	—	—	49	S.W.	Showers of rain; the wind is fallen.

The frames were uncovered at 8 o'clock in the morning, and covered up at 5 in the afternoon with double mats. In the morning I stopped the plants, picked off the showing fruit where they were too thick, thinned their leaves, and set the fruit that I found in blossom. At 3 o'clock water about 60 degrees warm was poured on every part of the flues. Air was admitted day and night.

Thursday, May 2, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.	
5	—	—	43	W.	Thin clouds cover the sky.
8	70	82	50	W.	Showery.
10	71	82	51	W.	Ditto. [of wind.
12	72	82	45	W.	Heavy showers, and gusts
1	73	82	48	W.	A heavy shower of large hail.
2	80	83	48	N.W.	Windy, and great show-
3	75	83	47	N.W.	Ditto. [ery clouds.
5	70	83	45	N.W.	Ditto.
8	—	—	41	N.W.	Clouds here and there.

The frames were uncovered a little past 8 in

in the morning, and covered up in the afternoon about 5 o'clock with double mats. In the forenoon the plants were gone over and stopped, their leaves thinned, and the fruit in blossom set. Air was continued day and night. The south side lining, being sunk, was raised with fresh dung.

Friday, May 3, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.	
5	—	—	34	W.	Clear, and nearly calm,
8	67	81	43	W.	Scattered clouds.
10	80	82	49	N.W.	Ditto.
12	85	83	52	N.W.	Scattered great snowy-like clouds.
2	76	83	53	N.W.	Cloudy, and a brisk wind,
4	73	83	52	N.W.	Ditto.
6	68	83	50	N.W.	Ditto.
8	—	—	47	N.W.	Cloudy, nearly calm.

The frames were uncovered a little before 8 o'clock in the morning, and covered up about 6 in the evening with double mats. In the morning I stopped the plants, set the fruit in blossom, and thinned their leaves. Air was continued day and night.

Saturday, May 4, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.	
5	—	—	40	S.W.	The sun appears through foggy clouds.
8	73	83	48	S.W.	The sun shines faintly,
10	80	84	56	S.W.	Scattered clouds.
11	83	84	60	S.W.	Ditto.
12	78	84	59	S.W.	Cloudy.
2	80	84	57	S.W.	Ditto.
4	73	84	53	S.W.	Ditto.
8	—	—	45	S.W.	Ditto.

The frames were uncovered about 8 o'clock in the

the morning, and covered up in the afternoon at 5 o'clock with mats. In the morning the plants were stopped, their leaves thinned, and the fruit in blossom set. Air was given in the day-time, but the lights were shut down all night.

Sunday, May 5, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
5	—	—	44	S.W. Cloudy; there had been rain in the night.
6	—	—	48	S.W. Cloudy, windy.
8	72	83	50	W. Scattered clouds, windy.
10	75	83	49	W. Cloudy, windy.
11	77	84	50	W. Ditto,
1	76	85	55	N.W. Ditto.
2	80	85	56	N.W. Scattered clouds.
4	75	85	53	N.W. Ditto.
10	—	—	40	N.W. Clear, and nearly calm.

The frames were uncovered about 8 o'clock in the morning, and covered up about 5 in the afternoon with double mats. Air was admitted in the day-time, but the lights were shut close down about 5 in the afternoon.

Monday, May 6, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	—	—	36	N.W. Clear, and nearly calm.
7	69	82	40	N.W. Sunshine.
10	84	85	49	N.W. Ditto.
12	87	86	56	N.W. Dusty-like clouds arise
2	80	86	55	N. Cloudy. [in the north.
4	76	86	54	N. Ditto,
6	—	—	51	N. Ditto.

The frames were uncovered about 7 o'clock in the morning,

morning, and covered up at 5 in the evening with double mats. Air was given in the day-time, but none during the night.

Tuesday, May 7, 1793.

Hours. S. Th. P. Th. Ther. Wind.

6	—	—	40	N. Cloudy, gloomy.
8	74	84	44	N. Scattered clouds, and light
10	80	84	48	N. Ditto. [showers.
12	75	85	52	N. Ditto.
2	75	85	50	N. Cloudy, nearly calm.
4	77	85	48	N. Showery.
8	—	—	45	N. Clear; the air looks frosty.

The frames were uncovered at 8 o'clock in the morning, and covered up between 5 and 6 in the evening with mats. In the forenoon the plants were stopped, their leaves thinned, the fruit in blossom set, and the weeds picked out of the mould. About noon the plants were well watered, with water near 80 degrees warm. The water was given out of pots with roses on them, and it was poured in between the leaves, so that the leaves were not much wetted nor weighed down thereby; but every part of the mould was well watered, and plenty was poured on the flues. Air was admitted from 9 o'clock in the morning till 5 in the afternoon, when the lights were shut down for the night. The south side lining being sunk was raised with hot dung.

Wednesday,

Wednesday, May 8, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	—	—	41	E. Foggy, nearly calm.
8	77	83	49	E. The sun glimmers.
10	83	84	54	E. Scattered clouds.
12	80	85	58	S. E. Ditto.
2	78	86	60	S.W. Ditto.
4	76	86	55	S.W. Cloudy, nearly calm.
8	—	—	48	S.W. Clear, nearly calm.

The frames were uncovered before 8 o'clock in the morning, and covered between 5 and 6 in the evening with double mats. In the morning the plants were stopped, their leaves thinned, and the fruit in blossom set. Air was admitted at 8 o'clock in the morning, and continued day and night.

Thursday, May 9, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	—	—	45	S.W. It rains, and there had been a good deal in the night.
8	68	82	50	S.W. Cloudy, gloomy.
10	69	82	51	S.W. Showers of rain.
12	79	83	59	S.W. The sun glimpses.
2	81	84	61	S.W. Ditto.
4	78	84	60	S.W. Scattered clouds.
5	71	84	57	S.W. Ditto.
6	—	—	54	S.W. Showery.

The frames were uncovered about 8 o'clock in the morning, and covered about 5 in the afternoon with double mats. In the afternoon I stopped the plants, thinned out some of their leaves, and set the fruit that I found in blossom. Air was continued day and night.

Friday,

Friday, May 10, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
5	—	—	40	S.W. Cloudy, and nearly calm.
8	72	82	50	S.W. Ditto.
10	79	83	56	S. Ditto.
12	80	83	61	S. Ditto.
1	79	83	61	S. It rains a little.
2	80	83	61	S. The sun shines faintly.
5	75	83	58	S. Cloudy, gloomy.
8	—	—	49	S. Ditto.

The frames were uncovered about 8 o'clock in the morning, and covered up between 5 and 6 in the afternoon with double mats. At noon I stopped the plants, set the fruit in blossom, and thinned their leaves. In the afternoon the tiles and bricks that lay above the side flues for the plants to run on, were taken out, and all the flues covered with mould, and made on a level with the mould that was in the bed before, and put close home to the sides of the frames, and pressed down gently, making it of an equal firmness with the mould that the plants were growing in; the plants were then trained out on the fresh mould, and the lights shut close down for the night.

Saturday,

Saturday, May 11, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
5	—	—	49	S. Cloudy, and nearly calm.
8	71	82	58	S. Showery-looking clouds.
10	77	82	60	S. E. The sun appears faintly.
12	81	84	67	S. E. Ditto.
2	80	84	66	E. Ditto.
5	68	83	58	E. Since 2 o'clock there have been light showers of rain.
6	—	—	57	E. Clouds, and the sun appears through them.
8	—	—	53	E. Gloomy.

The frames were uncovered about 8 o'clock in the morning, and covered up between 5 and 6 in the evening with double mats. In the forenoon I stopped the plants, thinned their leaves, and set the fruit that I found in blossom. Air was admitted day and night.

Sunday, May 12, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
5	—	—	50	E. Cloudy, and nearly calm.
7	70	82	55	E. Sunshine.
9	89	84	60	E. Ditto.
10	89	85	65	E. Ditto.
12	90	86	71	N. E. Light clouds here and [there.]
1	87	87	75	N. E. Ditto.
2	84	87	75	N. E. Bright sunshine.
4	82	87	71	N. E. Ditto.
8	—	—	60	N. E. Clear, and nearly calm.

The frames were uncovered about 7 o'clock in the morning, and covered up about 6 in the afternoon
 2 with

with mats. Air was admitted plentifully in the day-time, and about an inch left at each light all night.

Monday, May 13, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
5	—	—	48	N. E. Much dew, misty, and a brisk wind.
8	70	84	52	N. E. Light foggy clouds.
10	88	85	60	N. E. Sunshine, brisk gale of [wind.
12	87	87	67	N. E. Ditto.
1	82	87	68	N. E. Ditto.
2	87	87	71	N. E. Bright sunshine.
3	89	88	72	N. E. Ditto.
5	83	86	68	N. E. Sunshine, windy.
6	—	—	63	E. Clouds here and there.

The frames were uncovered about 8 o'clock in the morning, and covered up in the afternoon about half past 5 with double mats. In the morning I went over the plants and stopped them, thinned their leaves, set the fruit in blossom, and picked off the worst fruit where they were showing too thick. About 3 o'clock the plants were well watered with water which had stood in the sun till it was 70 degrees warm. Great plenty of air was admitted in the day-time, and a little was left at each light all night.

Tuesday,

Tuesday, May 14, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
5	—	—	42	N. E. Clear, and a brisk wind.
7	69	83	48	N. E. Sunshine, windy.
9	78	83	52	N. E. Ditto.
10	84	85	55	N. E. Ditto.
12	85	87	58	N. E. Ditto.
2	81	87	60	N. E. Ditto.
4	83	87	59	N. E. Clouds here and there.
5	78	87	58	N. E. Ditto.
8	—	—	50	N. E. Clear, and nearly calm.

The frames were uncovered about 7 o'clock in the morning, and covered up a little before 6 in the afternoon with double mats. In the morning the plants were stopped, their leaves thinned, and the fruit in blossom set. Air was given plentifully day and night.

Wednesday, May 15, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	—	—	47	W. Clear, and a brisk air of
7	73	85	50	W. Sunshine. [wind.
9	82	85	55	N.W. Ditto.
10	85	86	59	N.W. Ditto.
12	83	87	66	N.W. The air is overcast with light clouds.
2	83	87	63	N.W. Cloudy, and a brisk wind.
5	74	86	59	N. Ditto.
7	—	—	53	N. E. Ditto.

The frames were uncovered about 7 o'clock in the morning, and covered up between 5 and 6 in the afternoon with double mats. In the morning the
O plants

plants were stopped, their leaves thinned, and the fruit in blossom set. Air was given plentifully all the day, and a little left at each light all night.

Thursday, May 16, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	70	84	40	N. E. Light flying clouds, brisk gale of wind.
9	82	85	50	N. E. Sunshine, windy.
10	84	86	55	N. E. Ditto.
12	84	87	58	N. E. Ditto.
1	82	87	58	N. E. Ditto.
2	84	87	60	N. E. The sky is overcast with light clouds.
4	73	79	61	N. E. The wind is fallen.
6	78	81	59	N. E. Light clouds, nearly calm.
8	—	—	55	N. E. Ditto.

The frames were uncovered at 6 o'clock in the morning, and covered up at 6 in the afternoon with double mats. In the morning the plants were gone over and stopped, their leaves thinned, and the fruit in blossom set. The plants were shaded with thin mats from about 12 till 2 o'clock, and about 3 o'clock they were well watered: The water was about 65 degrees warm, and was poured all over the plants, and against the sides of the frames to wash and sweeten them; to each three-light frame of plants was given a hoghead of water. Air was continued all the day, and a little left all night.

Friday,

Friday, May 17, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	73	83	50	W. Foggy clouds all over
9	79	84	58	N.W. Ditto. [the air.
10	81	84	62	N.W. Ditto.
12	76	84	63	N.W. Ditto.
2	80	85	63	N.W. Ditto.
4	87	86	65	N.W. The sun shines now and then.
7	—	—	52	N.W. It has rained since 6
8	—	—	52	N.W. Fair, hazy. [o'clock.

The frames were uncovered about 6 o'clock in the morning, and covered up between 5 and 6 in the evening with double mats. In the morning I went over the plants and stopped them, thinned their leaves, set the fruit that I found in bloom, and rubbed off several young fruit where they were showing too thick. Air was admitted all the day, but the lights were shut close down all night.

Saturday, May 18, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	73	85	46	N. E. Cloudy, and a brisk wind.
8	75	85	50	N. E. The sun shines faintly.
10	79	85	55	N. E. Scattered clouds.
12	81	86	58	N. E. Cloudy.
1	80	86	63	N. E. Ditto.
4	75	85	59	N. E. Showery-like clouds.
6	77	86	52	N. E. Gloomy.
8	—	—	49	N. E. Light clouds.

The frames were uncovered about 6 o'clock in the morning, and covered up at 6 o'clock in the afternoon

noon with double mats. In the morning the plants were stopped, their leaves thinned, and the fruit in blossom set. Air was given in the day-time, and the lights shut down all night.

Sunday, May 19, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	—	—	41	N. Cloudy, and a cold wind.
8	70	84	44	N. Gloomy and cold.
10	75	84	49	N. Light clouds.
12	78	84	55	N. E. Ditto.
2	82	85	56	N. E. Ditto.
4	78	85	53	N. E. Cloudy and windy.
5	83	86	51	N. E. Sunshine.
9	—	—	42	N. E. Clear, and a brisk wind.

The frames were uncovered about 8 o'clock in the morning, and covered up about half past 5 in the afternoon with double mats. But little air was admitted in the day-time, and the lights were shut down all night.

Monday, May 20, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
5	—	—	35	N. E. Clear, and a white frost.
7	71	83	42	N. E. Sunshine, and a brisk
9	78	83	49	N. E. Ditto. [wind.
10	80	84	52	N. E. Scattered light clouds.
12	87	86	59	N. E. Sunshine.
2	85	86	60	N. E. Ditto.
4	90	86	58	N. E. Small clouds here and there.
5	87	87	56	N. E. Bright sunshine.

The frames were uncovered about 7 o'clock in the morning, and covered up between 5 and 6 in the

the afternoon with double mats. In the morning I stopped the plants, thinned their leaves, set the fruit in blossom, and thinned the fruit where they were showing too thick. Air was given plentifully in the day-time, but the lights were shut close down all night.

Tuesday, May 21, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
5	—	—	41	N. E. Foggy clouds come from the north-east.
7	74	84	45	N. E. Sunshine, and a brisk
9	80	84	53	N. E. Ditto. [wind.
10	87	55	58	N. E. Ditto.
11	90	86	62	N. E. Ditto.
12	90	87	65	N. E. Ditto.
2	89	88	66	N. E. Scattered clouds, windy.
4	93	88	64	N. E. Ditto.
6	—	—	55	N. E. Clear, and windy.
8	—	—	49	N. E. Ditto.

The frames were uncovered about 7 o'clock in the morning, and covered up between 4 and 5 in the afternoon with double mats. In the morning the plants were stopped, their leaves thinned, and the fruit in blossom set. Plenty of air was admitted in the day-time, and a little left all night at each light. The linings being sunk were raised all round with hot dung.

At noon I held among the water in the spring, a thermometer, and it fell, and stood at 45, and when I held it in the water running from the pipe it rose, and stood at 52. I then plunged it in the pond

in the water exposed to the sun and air, and it rose, and stood at 64. After that I set the thermometer on the ground upright, on a south border exposed to the sun, close by a row of peas in blossom, and it soon rose, and stood at 100. In walking about the fields between 12 and 1 o'clock with a thermometer hanging in my hand, it kept rising and falling between 65 and 70 degrees,

Wednesday, May 22, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	—	—	44	N. E. Cloudy, and a cold wind.
9	74	85	48	N. E. Ditto.
10	84	86	50	N. E. The sun shines faintly.
12	83	86	56	N. E. Thin clouds.
2	85	87	57	N. E. Sunshine.
4	79	86	55	N. E. Cloudy, and a brisk gale
6	75	86	51	N. E. Ditto. [of wind.
8	—	—	46	N. E. Ditto.

The frames were uncovered just before 9 o'clock in the morning, and covered up in the afternoon about 6 with double mats. In the morning the plants were stopped, their leaves thinned, and the fruit in blossom set. Between 2 and 3 o'clock plenty of water was poured upon the mould above the flues, but there was none given to the mould near the stems of the plants. Air was given in the day-time, but the lights were shut close down all night.

Thursday,

Thursday, May 23, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
5	—	—	42	N. E. Foggy light clouds.
8	75	84	49	N. E. Ditto.
10	85	85	57	N. E. Sunshine.
12	87	87	66	N. E. Clouds here and there.
2	84	87	67	N. E. Ditto.
3	85	87	66	N. E. Ditto.
4	77	87	62	N. E. Sunshine.
5	75	87	62	N. E. Scattered clouds, near calm.
9	—	—	49	N. E. Clear, and nearly calm.

The frames were uncovered about 8 o'clock in the morning, and covered up between 5 and 6 in the evening with double mats. In the afternoon the plants were stopped, their leaves thinned, and the fruit in blossom set. Air was admitted plentifully in the day-time, and a little left all night at each light.

Friday, May 24, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	—	—	44	N. E. Foggy, and nearly calm.
9	72	84	49	N. E. Ditto.
10	74	84	49	N. E. Foggy clouds, and a brisk [wind.
12	76	84	49	N. E. Ditto.
2	80	84	56	N. E. Ditto.
4	85	85	57	N. E. Scattered clouds.
5	90	86	57	N. E. Ditto.
8	—	—	48	N. E. Clear, and a brisk gale of wind.

The frames were uncovered about 9 o'clock in the morning, and covered up in the afternoon between 5 and 6 with double mats. In the afternoon I

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stopped

stopped the plants, thinned their leaves, and set the fruit in blossom. Air was admitted till 4 o'clock in the afternoon, when the lights were shut close down for the night.

Saturday, May 25, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
5	—	—	36	N. E. Foggy flying clouds.
7	72	84	44	N. E. Sunshine.
10	82	85	53	N. E. Scattered clouds, and a brisk wind.
12	87	87	60	N. E. Sunshine.
2	85	87	60	N. E. Scattered white clouds.
4	82	87	58	N. E. Ditto.
5	90	87	56	N. E. Thin clouds cover the sky.
8	—	—	51	N. E. Ditto, and a brisk gale of wind.

The frames were uncovered about 7 o'clock in the morning, and covered up between 5 and 6 in the afternoon with double mats. In the morning the linings were raised with fresh dung, the plants were stopped, their leaves thinned, and the fruit in blossom set. In the day-time air was admitted plentifully, and a little was left all night at each light.

Sunday,

Sunday, May 26, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	—	—	43	N. E. Bright sunshine.
7	74	85	44	N. E. Ditto.
9	85	87	51	N. E. Ditto.
10	90	87	54	N. E. Ditto.
1	80	87	68	N. E. The sky is overcast with light clouds.
2	83	87	67	N. E. Thin clouds, and a brisk gale of wind.
3	80	87	62	N. E. Gloomy.
4	74	87	55	N. E. Ditto.
8	—	—	48	N. E. Clear, and a brisk gale of wind.

The frames were uncovered about 7 o'clock in the morning, and covered up about 5 in the afternoon with double mats. Air was given plentifully in the day-time, and a little left all night.

Monday, May 27, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	—	—	43	N. E. Foggy clouds, and a brisk
7	72	84	45	N. E. Ditto. [wind.
8	80	85	48	N. E. Ditto.
11	90	87	61	N. E. Sunshine.
1	86	87	69	N. E. The air is overcast with
2	80	87	70	N. E. Ditto. [light clouds.
3	65	70	68	N. E. Cloudy, and near calm.
4	75	74	64	N. E. Gloomy; the clouds look rainy.
9	—	—	55	N. E. Clouds here and there.

The frames were uncovered about 7 o'clock in the morning, and covered up between 5 and 6 in the afternoon

noon with about 3 inches thick of hay and mats. In the morning the plants were stopped, their leaves thinned, the weeds picked out, and the fruit in blossom set. Between 2 and 3 o'clock I gave the plants a plentiful watering with water about 65 degrees warm. I gave to each three-light frame about half a hoghead, and when the watering was finished, the lights were shut close down for the night.

Tuesday, May 28, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
5	—	—	45	S.W. Foggy, and a brisk wind.
7	79	85	53	W. Cloudy.
10	83	86	62	W. The sun glimpses.
12	85	87	65	N.W. Cloudy, and a brisk wind.
2	83	87	67	N.W. Cloudy, and nearly calm.
3	88	87	66	N.W. Scattered clouds.
5	81	88	62	N.W. Ditto.
6	—	—	59	N.W. Sunshine.
8	—	—	53	N.W. Clear, and nearly calm.

The frames were uncovered about 7 o'clock in the morning, and covered up in the afternoon about half past 5 with double mats. In the afternoon the plants were stopped, their leaves thinned, and the fruit in blossom set. Air was admitted about 8 o'clock in the morning, and increased gradually, and at 5 o'clock in the afternoon the lights were shut close down for the night. The fourth side lining, being sunk, was raised with hot dung.

Wednesday,

Wednesday, May 29, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	72	86	42	N. Sunshine, and a brisk wind
8	73	86	44	N. Great showery-like clouds
10	81	87	48	N.W. Scattered clouds. [arise.
12	79	87	54	N.W. Ditto.
2	82	88	55	N.W. Ditto.
4	79	88	54	N.W. Cloudy, and a brisk wind.
5	81	88	51	N.W. Ditto.
8	—	—	46	N.W. Clouds here and there; nearly calm.

The frames were uncovered about 6 o'clock in the morning, and covered up at half past 5 in the afternoon with double mats. In the morning [the plants were stopped, their leaves thinned, and the fruit in bloom set. About 4 o'clock in the afternoon water was poured plentifully all round about against the insides of the frames to sweeten the flues, so that therefrom a kindly steam might arise during the night to nourish and invigorate the plants. Air was admitted at 7 o'clock in the morning, and continued all day, and a little left all night

Thursday,

Thursday, May 30, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
5	—	—	38	N. Clear, and a brisk wind.
6	68	85	39	N. Sunshine.
8	76	85	45	N.W. Scattered clouds.
10	80	86	46	N.W. Ditto.
12	88	87	52	N.W. Sunshine.
1	89	88	54	N.W. Ditto.
2	88	89	54	N.W. Scattered clouds.
4	87	89	52	N.W. Ditto. [clouds.
5	86	90	49	N.W. Stormy, and great white
7	—	—	46	N.W. Clear, and nearly calm.
8	—	—	43	N.E. Ditto.

The frames were uncovered about 6 o'clock in the morning, and covered up about 5 in the afternoon with double mats. In the morning the plants were stopped, their leaves thinned, and the fruit in blossom set. Air was admitted till near 5 o'clock in the afternoon, when the lights were shut close down for the night.

Friday, May 31, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
5	—	—	33	S.W. Clear, and a white frost.
7	73	86	41	W. Clouds here and there.
10	86	87	50	W. Scattered clouds.
12	83	88	57	W. Cloudy, and a brisk wind.
2	85	88	58	W. Scattered clouds; a few drops of rain fall.
4	91	89	59	W. Scattered clouds.
5	89	90	57	W. Ditto. [south-west.
8	—	—	50	N.W. Great black clouds in the

The frames were uncovered at 7 o'clock in the morning,

morning, and covered up about 5 in the afternoon with double mats. In the morning the plants were stopped, their leaves thinned, and the fruit in blossom set. Air was given about 8 o'clock in the morning, and continued till 5 in the afternoon, when the lights were shut close down for the night.

Saturday, June 1, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	72	86	44	W. Clear, and a brisk wind.
8	80	87	50	S.W. Sunshine.
10	85	88	57	S. Scattered clouds.
12	89	89	61	S. Sunshine.
1	89	91	64	S. Ditto
2	89	91	65	S. Thin streaky clouds.
4	79	90	64	S. Ditto.
6	—	—	61	S. Ditto.
8	—	—	55	S. Cloudy, gloomy, calm.

The frames were uncovered at 6 o'clock in the morning, and covered up about 6 in the afternoon with double mats. In the morning I went over the plants and stopped them, thinned out their leaves, set the fruit in blossom, and nipped off here and there several of the young fruit where I found them set too thick. Air was admitted a little before 8 o'clock in the morning, and continued till 4 in the afternoon; then I poured water plentifully on the mould above the flues, and against the sides of the frames. The water raised the thermometer to 65 degrees.

Sunday,

Sunday, June 2, 1793.

Hours. S.Th. P.Th. Ther. Wind.

6	—	—	53	S. Cloudy and windy.
8	77	87	58	S. Ditto.
10	75	87	59	S. Ditto.
11	80	87	60	S. Ditto.
2	76	87	62	S. E. Cloudy; a few drops of rain
4	74	87	60	S. E. Cloudy, windy. [fall.
9	—	—	54	S. E. The wind is fallen.

The frames were uncovered about 8 o'clock in the morning, and covered up about 6 in the evening with double mats. Air was given from 8 in the morning till 4 in the afternoon, when the lights were shut down for the night.

Monday, June 3, 1793.

Hours. S.Th. P.Th. Ther. Wind.

6	78	86	54	S. Clear, and nearly calm.
8	79	86	59	S.W. Clouds here and there.
10	82	87	69	S.W. Sunfhine.
11	84	88	69	S.W. Ditto.
12	85	88	69	S.W. Scattered clouds.
2	83	88	70	S.W. Ditto.
4	95	89	68	S.W. Sunfhine, near calm.
7	—	—	62	S.W. Ditto.
9	—	—	54	S.W. Clear and calm.

The frames were uncovered about 6 o'clock in the morning, and covered up a little before 6 in the afternoon with mats. In the morning the plants were stopped, their leaves thinned, and the fruit in blossom set. In the afternoon, between 3 and 4 o'clock, I gave each light of plants two pot-fulls of water about

about 63 degrees warm, all over their leaves. Air was given at 7 o'clock in the morning, and continued till 7 in the evening, when it was taken away for the night.

Tuesday, June 4, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
5	—	—	55	S. E. Thin light clouds here
6	76	87	57	S E. Ditto. [and there.
8	80	88	62	S. Ditto.
10	82	88	70	S. Ditto.
11	84	89	74	S. Scattered clouds.
12	85	89	78	S. The sun shines faintly.
2	83	89	75	S. Cloudy, and nearly calm.
3	86	89	76	S. The sun glimmers.
4	85	89	73	S.W. Ditto.
6	—	—	68	S.W. Cloudy, and nearly calm.
9	—	—	59	S.W. Ditto.

The frames were uncovered at 6 o'clock in the morning, and covered up about half past 5 in the afternoon with mats. In the morning I stopped the plants, thinned their leaves, picked off several small fruit where they were set too thick, and set the fruit in blossom. Air was given at 7 o'clock in the morning, and continued till between 4 and 5 in the afternoon, when the lights were shut close down for the night.

Wednesday,

Wednesday, June 5, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
5	—	—	52	S.W. Light clouds here and
6	76	86	55	S.W. Sunshine. [there.
8	85	88	69	S. E. Clouds here and there.
10	86	89	74	S. E. The sun shines faintly.
11	79	88	70	S. Cloudy, gloomy; a few drops of rain fall.
12	82	88	71	S. A light shower of rain.
2	83	89	73	S.W. Cloudy, and nearly calm.
3	82	89	73	S. Ditto.
4	84	89	71	S. Sunshine.
5	85	89	69	S.W. Clouds here and there.
9	—	—	59	S. Clear, and nearly calm.

The frames were uncovered at 6 o'clock in the morning, and covered up just before 6 in the afternoon with single mats.

In the morning I stopped the plants, thinned their leaves, and set the fruit in blossom. Air was admitted at 7 o'clock in the morning, continued all day, and a little left at each light all night.

Thursday, June 6, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
5	—	—	52	S.W. Cloudy, and a brisk wind.
6	72	86	55	S.W. Ditto.
8	80	86	60	S.W. The sun shines faintly.
10	83	87	65	S.W. Ditto.
11	83	87	71	S.W. Cloudy.
12	75	87	68	S.W. A few drops of rain fall.
2	75	87	66	S.W. Gloomy.
4	76	87	62	S.W. It rains lightly.
5	75	87	60	S. It rains gently.
9	—	—	55	S. Cloudy, and a brisk wind.

The frames were uncovered at 6 o'clock in the morning,

morning, and covered up a little before 6 in the afternoon with single mats. In the morning I stopped the plants, thinned their leaves, and set the fruit in blossom. At noon plenty of water was poured upon the mould above the flues, and against the sides of the frames, and just before covering up the plants were sprinkled all over till their leaves were well wetted. Air was given all day till about 6 o'clock in the afternoon, when the lights were shut down for the night.

Friday, June 7, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
5	—	—	55	S.W. Clear in the west, cloudy in the east.
6	72	84	56	S.W. Cloudy, gloomy.
8	77	84	58	S.W. Scattered clouds, nearly
10	83	85	62	S.W. Ditto. [calm.
11	86	86	66	S.W. Ditto.
12	85	87	71	S.W. Great clouds, and gusts of
1	85	87	71	S.W. Ditto. [wind.
2	85	87	70	S.W. Ditto.
4	80	87	68	S.W. Sunshine.
8	—	—	57	S.W. Clear, and a brisk wind.
9	—	—	53	S.W. Ditto.

The frames were uncovered about 6 o'clock in the morning, but there was no covering put on in the evening. In the morning the plants were stopped, their leaves thinned, and the fruit in blossom set. The linings were raised all round with hot dung. At 5 o'clock in the afternoon with water about 67 degrees warm, I watered the plants all over till their leaves were well wetted.

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Saturday,

Saturday, June 8, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	72	84	56	S.W. Cloudy, and a brisk wind.
8	78	84	59	S.W. Ditto.
10	80	85	61	S.W. Showery-like clouds.
12	85	85	64	S.W. Windy, and large clouds here and there.
2	83	85	64	S.W. A light shower.
5	84	86	62	S.W. Squally.
7	76	86	58	S.W. Cloudy and windy.
9	—	—	56	S.W. Showery-like clouds.

In the morning the plants were stopped, their leaves thinned, the weeds picked out, and the fruit in blossom set. Air was given between 7 and 8 in the morning, and continued till about 5 in the afternoon, when the plants were sprinkled with water, and the lights shut close down for the night. To-day we gathered peas for the first time this season; they were sown in December on a south-wall border, in a row 6 feet distance from the wall.

Sunday, June 9, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	68	83	50	S.W. Clear, and a brisk gale of wind.
8	83	83	54	S.W. Clouds come swiftly from the south-west.
10	82	83	58	S.W. Cloudy and windy.
1	82	84	64	S.W. Ditto.
2	83	84	65	S.W. The sun shines now and
4	88	86	64	S.W. Sunshine. [then.
8	77	86	55	S.W. Clouds here and there; the wind is fallen.

Air was admitted at 8 o'clock in the morning, and continued

continued till between 4 and 5 in the afternoon, when the lights were shut down for the night.

Monday, June 10, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
5	65	83	48	S.W. Clear, and a brisk wind.
8	80	83	56	S.W. Clouds come swiftly from the south-west.
10	78	83	61	S.W. Scattered clouds.
12	80	85	64	S.W. Ditto.
2	82	85	66	S.W. Clouds here and there.
4	79	85	64	S.W. The sun glimpses.
6	67	82	58	S.W. Ditto.
8	—	—	52	S.W. Some clouds, nearly calm.

Air was admitted about 8 o'clock in the morning, when I stopped the plants, thinned their leaves, and set the fruit in blossom. Between 5 and 6 in the afternoon I gave the plants of each three-light frame about half a hoghead of water, which I poured all over their leaves out of wide rosed water-pots; but I poured on most above the flues and against the sides of the frames; the water was 64 degrees warm. When the watering was finished the lights were shut close down, and covered up with about 4 inches thick of hay and mats.

Tuesday, June 11, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	77	84	50	S.W. The sky is covered with thin streaky clouds.
8	81	85	59	S.W. Cloudy.
10	82	85	63	S.W. Ditto.
12	85	86	66	S.W. The sun shines.
2	87	87	69	S.W. Clouds here and there.
4	88	88	67	S.W. Ditto.
6	86	88	64	S.W. Cloudy, and nearly calm.
9	—	—	55	S.W. Ditto.

The frames were uncovered about 6 o'clock in the morning, and covered up in the afternoon about half past 5 with double mats. In the morning the plants were stopped, their leaves thinned, and the fruit in blossom set. Air was given at 7 o'clock in the morning, and continued till 5 in the afternoon, when the lights were shut down for the night.

Wednesday, June 12, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	74	86	48	W. Clear, and a brisk wind.
8	79	86	52	W. Scattered clouds.
10	83	87	57	W. Cloudy.
12	89	88	65	N.W. Light clouds.
2	86	88	64	N.W. Ditto.
4	88	89	62	N.W. Scattered clouds.
6	—	—	59	N.W. Ditto.
9	—	—	55	N.W. Cloudy, and nearly calm.

The frames were uncovered about 6 o'clock in the morning, and covered up about half past 5 with double mats. In the morning I stopped the plants, thinned their leaves, and set the fruit in blossom. Air

was admitted from 7 o'clock till 3 in the afternoon, when the plants were sprinkled with clean water, and the lights shut down for the night.

Thursday, June 13, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	—	—	50	N. E. Cloudy, and a brisk wind.
8	80	87	55	N. E. Ditto.
10	83	87	58	N. E. Ditto.
12	83	87	59	N. E. Light clouds.
2	80	87	59	N. E. Ditto
4	78	87	55	N. E. Cloudy, and a brisk gale
6	77	87	52	N. E. Ditto. [of wind.
9	—	—	49	N. E. Ditto,

The frames were uncovered about 7 o'clock in the morning, and covered up about 5 in the afternoon with double mats. About noon the plants were stopped, their leaves thinned, and the fruit in blossom set. Air was given at 8 o'clock in the morning, and taken away at 3 in the afternoon. To-day I had a new lining applied to the north side of the bed. The old lining being exhausted, there was no heat in it, but a warmth, and that derived from the south side lining; therefore I had it all removed, except only about six inches of the top of it, which was not quite exhausted, and which I had laid in the foundation of the new lining. The new lining was made of a mixture of cow and horse dung, which had lain in a heap for a few days till it had become very warm,

Friday, June 14, 1793.

Hours. S.Th. P.Th. Ther. Wind.

6	72	84	46	N. Cloudy, and a brisk gale of
8	74	84	48	N. Ditto. [wind.
10	85	85	54	N. Ditto.
12	83	86	58	N. Ditto.
2	82	86	57	N. Ditto.
4	83	86	55	N. The sun glimmers.
5	82	87	55	N. Ditto.
8	—	—	48	N. Cloudy, and nearly calm.

The frames were uncovered about 6 o'clock in the morning, and covered up about half past 5 in the afternoon with double mats. In the morning I stopped the plants, thinned their leaves, picked off the young fruit where they were set too thick, and set the fruit in blossom.

Saturday, June 15, 1793.

Hours, S.Th. P.Th. Ther. Wind.

6	72	85	45	N.W. Thick close clouds cover
8	72	85	48	N.W. Ditto. [the sky,
10	80	85	54	N.W. The sun appears faintly.
12	83	86	61	N.W. Ditto.
2	87	88	60	W. Sunshine.
4	89	89	61	S.W. Ditto.
6	84	89	55	S.W. Gloomy; the clouds look
8	79	89	50	S.W. Ditto. [rainy.

The frames were uncovered about 6 o'clock in the morning, but no covering was put on for the night. In the morning the plants were stopped, their leaves thinned, and the fruit in blossom set. Air was admitted about 9 o'clock in the morning, and continued till

till between 4 and 5 in the afternoon, when the lights were shut down for the night. The north side lining, being sunk, was raised with fresh dung, and was made rather higher than the surface of the earth on the bed.

Sunday, June 16, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	72	86	50	W. Light clouds, and a brisk
8	79	86	58	W. Ditto. [wind.
10	83	87	62	W. Ditto.
11	87	88	66	W. The sun shines faintly.
1	88	89	70	W. Ditto.
2	86	89	69	W. Ditto.
4	80	89	66	W. Cloudy, and a brisk gale of
6	—	—	55	W. It rains a little. [wind.
9	—	—	53	W. Fair, cloudy.

Air was given about 8 o'clock in the morning, and taken away at 4 in the afternoon. The frames were covered up at 5 in the afternoon with double mats.

Monday, June 17, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	75	88	55	N.W. Cloudy, and a brisk wind.
8	76	88	56	N.W. A light shower of rain.
10	85	89	62	N.W. The sun glimpses.
12	86	90	68	N.W. Scattered clouds, windy.
1	70	78	69	W. Ditto.
2	84	84	67	W. Flying clouds, windy.
4	86	86	64	W. Ditto.
9	—	—	55	W. Clear, and a brisk gale of wind.

The frames were uncovered at 6 o'clock in the
P 4 morning,

morning, and covered up about half past 5 in the afternoon with double mats. In the morning the plants were stopped, their leaves thinned, and the fruit in blossom set. Between 12 and 1 o'clock I gave the plants a good soaking of water about 62 degrees warm; it was poured on all over their leaves out of wide rofed water-pots. Air was given about 8 o'clock in the morning, and continued till 4 in the afternoon, when the lights were shut close down for the night.

Tuesday, June 18, 1793.

Hours. S. Th. P. Th. Ther. Wind.

6	73	89	45	N.W.	Clear, and a strong gale of wind.
9	80	89	50	N.W.	Scattered great clouds.
10	83	90	54	N.W.	Ditto.
12	85	91	58	N.W.	Ditto.
2	89	93	61	N.W.	Light clouds.
5	85	93	59	N.W.	Sunshine.
9	—	—	53	N.W.	Gloomy.

The frames were uncovered at 6 o'clock in the morning, and covered up about half past 5 in the afternoon with double mats. In the morning I stopped the plants, thinned their leaves, and set the fruit in blossom. Air was admitted between 8 and 9 o'clock in the morning, and continued till about 4 in the afternoon, when the lights were shut down for the night.

Wednesday,

Wednesday, June 19, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	76	91	52	W. Cloudy; there had been a shower in the night.
9	80	92	56	W. A drizzling rain.
10	78	92	55	W. It rains gently.
12	88	93	55	W. The sun glimpses.
2	86	93	51	N. A light shower.
5	89	93	52	N. Scattered clouds.
9	—	—	49	N. E. Cloudy, and nearly calm.

The frames were uncovered about 6 o'clock in the morning, and covered up at 5 in the afternoon with double mats. In the afternoon the plants were stopped, their leaves thinned, and the fruit in blossom set. Air was admitted about 8 o'clock in the morning, and taken away about half past 4 in the afternoon.

Thursday, June 20, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	—	—	47	N. Cloudy, and a cold wind.
7	76	91	49	N. Ditto.
10	76	91	50	N.W. Ditto.
12	78	91	50	N.W. Ditto.
2	80	91	52	N.W. Ditto.
4	80	91	52	N.W. Ditto.
5	81	91	53	N.W. Thin clouds, nearly calm.
9	—	—	46	N.W. Ditto.

The frames were uncovered about 7 o'clock in the morning, and covered up about half past 5 in the afternoon with mats. In the morning the plants were stopped, their leaves thinned, and the fruit in blossom set. But little air was given in the day-time, and at 4 in

4 in the afternoon the lights were shut down for the night. The north side lining, being sunk, was raised with new dung.

Friday, June 21, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	72	89	45	N. Clear, and nearly calm.
8	82	89	51	N. The sun shines faintly.
10	90	90	56	N.W. Scattered clouds.
11	98	92	60	N.W. Sunshine.
12	90	93	63	N.W. Scattered light clouds.
2	88	93	64	W. Ditto.
4	85	93	64	W. Ditto.
9	—	—	55	W. Some clouds, nearly calm.

The frames were uncovered at 6 o'clock in the morning, and covered up about 5 in the afternoon with mats. In the morning I stopped the plants, thinned their leaves, and set the fruit in blossom. Air was admitted at 8 o'clock in the morning, and increased plentifully, and a little left at each light all night.

Saturday, June 22, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	—	—	50	W. Cloudy, and a brisk gale
8	70	88	53	W. Ditto. [of wind.
10	70	88	55	N.W. A light shower.
12	84	89	58	N.W. Cloudy.
2	85	90	60	N.W. Ditto.
4	83	91	59	N.W. The sun glimpses.
8	—	—	53	N. Gloomy.

The frames were uncovered about 8 o'clock in the morning,

morning, and covered up between 5 and 6 in the afternoon with double mats. In the morning the plants were stopped, their leaves thinned, the weeds picked out, and the fruit in blossom set. Air was continued day and night. About 11 o'clock to each three-light frame of plants I gave about half a hoghead of water, which was from 60 to 65 degrees warm; most of it was poured on above the flues and against the sides of the frames, but the leaves of the plants were wetted as little as possible. To-day we gathered strawberries in the open ground for the first time this season.

Sunday, June 23, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	73	89	45	N.W. Clear, and a brisk gale of
10	85	90	57	N.W. Scattered clouds. [wind.
11	88	91	57	N.W. Sunshine.
1	90	93	62	N.W. Scattered clouds.
2	86	93	61	N.W. Ditto.
6	80	93	61	N.W. Ditto.
8	78	92	55	N.W. Cloudy, calm.

The frames were uncovered about half past 6 in the morning, and they were left uncovered all night. Air was continued day and night.

Monday,

Monday, June 24, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	70	88	50	W. Cloudy, and a few drops of rain fall.
8	72	88	55	W. Cloudy, gloomy.
10	80	89	62	W. The sun glimpses.
12	74	89	62	W. A small rain.
2	73	89	56	W. Ditto. [of wind.
4	75	89	57	W. Cloudy, and a brisk gale
8	—	—	53	W. Cloudy, nearly calm.

In the morning the plants were stopped, their leaves thinned, and the fruit in blossom set. The linings, being sunk, were raised all round with fresh dung. The lights were covered up between 5 and 6 o'clock in the afternoon with double mats. Air was admitted till 4, and then the lights were shut down till 8 o'clock in the evening, when a little air was admitted at each light for the night.

Tuesday, June 25, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	73	88	53	W. Cloudy.
8	76	88	59	W. Scattered clouds.
10	82	90	68	W. Ditto.
12	84	90	71	W. Cloudy, and nearly calm.
2	82	90	70	W. Gloomy.
3	81	91	69	W. Ditto.
6	77	91	63	S.W. Ditto.
9	—	—	57	S.W. Ditto.

The frames were uncovered at 6 o'clock in the morning, and covered up about 6 in the afternoon with single mats. In the morning the plants were stopped,

stopped, their leaves thinned, and the fruit in blossom set. Air was continued day and night.

Wednesday, June 26, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	67	88	58	W. Cloudy, and a brisk wind; there had been a light rain in the night.
8	73	88	63	W. Cloudy, and a brisk wind.
10	84	89	69	W. Scattered clouds.
12	85	90	71	W. Ditto.
2	84	91	73	W. Sunshine.
3	84	91	72	W. Scattered clouds.
4	83	91	74	W. Sunshine.
6	80	91	67	W. Ditto.
9	—	—	59	W. Clear, and a brisk wind.

The frames were uncovered about 6 o'clock in the morning, and left without covering all night. In the morning the plants were stopped, their leaves thinned, and the fruit in blossom set. Plenty of air was given all day, and some left all night. The linings, being funk, were raised with long dung.

Thursday, June 27, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
5	62	87	49	W. Clear, and a brisk wind.
8	80	88	56	W. Scattered light clouds.
10	85	90	69	W. Ditto.
12	88	91	73	W. Ditto.
2	85	92	74	S.W. Ditto.
3	86	92	75	S.W. Ditto.
4	82	92	71	S.W. Ditto.
9	—	—	56	S.W. Clear, and nearly calm.

About noon the plants were gone over and stop-

ped, their leaves thinned, and the fruit in blossom set, and at 3 o'clock water about 72 degrees warm was poured in all round the sides of the frames. Air was admitted plentifully till 5 in the afternoon, when the lights were shut down till 8, and then a little air was given for the night.

Friday, June 28, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	68	87	56	S.W. Thin clouds.
8	74	88	60	S.W. Ditto.
10	80	89	63	S.W. Showery-like clouds.
12	85	90	67	S.W. Cloudy, and a brisk gale of wind.
2	89	91	71	S.W. Light clouds.
4	86	92	68	S.W. Sunshine.
6	—	—	65	S.W. Thin clouds cover the sky.
9	—	—	56	S.W. Ditto.

In the morning the plants were stopped, their leaves thinned, and the fruit in blossom set. Air was continued till 5 in the afternoon, when the lights were shut down till 9, and then a little air was admitted for the night. At 6 o'clock in the evening the frames were covered up with single mats.

Saturday,

Saturday, June 29, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	76	91	56	S. Cloudy, and a strong gale
8	76	91	58	S. Ditto. [of wind.
10	77	91	62	S. Light showers.
12	76	91	64	S. Flying clouds, and a strong
2	82	92	65	S.W. Ditto. [gale of wind.
4	90	93	67	S.W. Sunshine, windy.
9	—	—	55	S.W. Cloudy and windy.

The frames were uncovered at 6 o'clock in the morning. In the forenoon the plants were stopped, their leaves thinned, and the fruit in blossom set. Air was continued day and night.

Sunday, June 30, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	71	89	55	W. Cloudy, and a strong gale of wind.
8	70	90	60	W. Flying clouds, windy.
10	80	90	65	W. Ditto.
12	85	91	69	W. A light shower of rain.
2	83	92	68	W. Windy, and flying clouds.
5	82	92	66	W. Ditto.
9	—	—	56	W. Cloudy, the wind is fallen.

Air was continued all day, and the lights were shut down all night.

Monday,

Monday, July 1, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	75	90	58	S.W. Cloudy and windy.
8	76	90	60	S.W. Ditto.
10	80	90	62	S.W. A drizzling rain.
12	76	92	70	S.W. Light clouds.
2	78	92	68	S.W. A small shower.
4	80	92	67	S.W. Scattered clouds.
9	—	—	56	S.W. Clear, and nearly calm.

In the morning the plants were stopped, their leaves thinned, and the fruit in blossom set. Air was admitted at 6 o'clock in the morning, and continued day and night.

Tuesday, July 2, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	69	88	53	W. Light clouds, and a brisk wind.
8	78	88	58	W. Windy and cloudy.
10	72	89	63	W. Ditto.
12	80	90	70	W. Scattered clouds, windy.
1	81	91	71	W. Ditto.
2	80	91	69	W. Ditto.
5	71	91	66	W. Sunshine, windy.
9	—	—	55	W. Clear, and nearly calm.

In the morning the plants were stopped, their leaves thinned, and the fruit in blossom set. Air was admitted all the day plentifully, and a little left at each light all night.

Wednesday,

Wednesday, July 3, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.	
6	68	87	51	W.	Clear, and a brisk wind.
8	80	88	58	W.	Sunshine.
10	85	89	67	W.	Scattered clouds.
12	85	91	73	W.	Ditto.
1	83	92	76	W.	The air is overcast.
2	82	92	74	W.	Thin clouds cover the
3	83	92	75	S.W.	Ditto. [sky.
4	80	92	74	S.W.	Ditto.
6	75	91	68	S.W.	Ditto.
9	—	—	60	S.W.	Cloudy, and a brisk wind.

In the morning the plants were stopped, their leaves thinned, and the fruit in blossom set. About 4 o'clock in the afternoon water 65 degrees warm was poured against the sides of the frames all round about, to moisten the flues and sweeten the air. Air was continued all day, and a little left all night.

Thursday, July 4, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.	
6	67	87	57	S.W.	Cloudy, and a brisk wind.
8	78	88	62	S.W.	A few drops of rain fall.
10	80	89	69	S.W.	Ditto.
11	78	88	71	S.W.	Cloudy and windy.
12	77	88	69	S.W.	Ditto.
2	80	85	73	S.W.	The sun glimmers.
4	78	86	71	S.W.	Ditto.
6	85	87	69	S.W.	Cloudy, and a strong gale of wind.

To-day about noon I had about two inches thick of leaf mould sifted fine, laid over all the surface of the bed among the plants; it was laid in with the hand

Q

hand carefully, and many of the oldest shoots were covered with it: When that was done I gave the plants a moderate watering all over their leaves, with water about 66 degrees warm. Air was given till 4 o'clock, when the lights were shut down till 6, and then a little air was admitted, and the lights covered up for the night with double mats. The linings being sunk below the upper course of bricks were raised with moist dung.

Friday, July 5, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	75	87	61	S.W. Thin clouds, and a brisk
8	79	87	67	S.W. Ditto. [gale of wind.
10	83	88	75	S.W. Sunshine, and a strong gale of wind.
12	90	90	81	S.W. Scatter'd clouds, windy.
1	89	91	78	S.W. Ditto.
2	94	92	80	S.W. Ditto.
4	92	92	80	S.W. Ditto.
5	88	92	78	S.W. Ditto.
8	82	92	70	S.W. Clear, and nearly calm.

The frames were uncovered at 6 o'clock in the morning, and then the plants were stopped, their leaves thinned, and the fruit in blossom set. Air was admitted plentifully all day till 8 o'clock in the evening, when the lights were shut close down for the night.

Saturday,

Saturday, July 6, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.	
6	78	90	63	W.	Foggy low clouds, a brisk wind, and no dew.
8	80	90	68	W.	Bright sunshine, and a
10	88	92	80	W.	Ditto. [brisk wind.
11	90	93	83	W.	Ditto.
12	93	94	85	S.W.	Ditto.
1	96	95	84	S.W.	Ditto.
2	99	96	84	S.W.	Small clouds here and there, nearly calm.
4	87	96	86	S.W.	Ditto.
4½	96	96	88	S.W.	Ditto.
6	86	95	80	S.W.	Clear and calm.
9	—	—	71	S.W.	Ditto.

In the morning the plants were stopped, their leaves thinned, and the fruit in blossom set. Air was plentifully admitted all day, and some left all night. Between 5 and 6 in the afternoon I gave to each frame of plants 6 small pots of water 75 degrees warm, which I poured all over their leaves in imitation of a shower of rain. To-day we gathered cherries for the first time this summer; they grew on an east aspect, but the tree is planted on the west side of the wall, and its branches are trained over the wall on the east side, and there the fruit ripens before those on the same tree, on the west aspect.

Q 2

Sunday,

Sunday, July 7, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	77	92	65	S. Bright sunshine, not a cloud
8	88	93	72	S. Ditto. [to be seen.
10	89	94	83	S. Sunshine.
12	90	95	87	S.W. Ditto.
1	91	95	89	S.W. Ditto.
2	90	95	90	S.W. Ditto.
4	93	96	88	S.W. Ditto.
5	95	96	86	S.W. Ditto.
9	—	—	75	W. Clear, and nearly calm.

Air was admitted plentifully day and night. The plants were shaded from about 11 o'clock till between 2 and 3 in the afternoon with thin mats.

Monday, July 8, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	76	93	63	N. E. Clear, and nearly calm.
8	84	94	69	N. E. Light flying foggy clouds.
10	92	94	80	N. E. Sunshine, and a brisk gale.
12	105	96	82	N. E. Ditto. [of wind.
2	102	98	80	N. E. Ditto.
4	95	98	80	N. E. Ditto.
6	82	97	74	N. E. Ditto.
9	—	—	62	N. E. Clear, and a brisk gale of wind,

In the morning the plants were stopped, their leaves thinned, and the fruit in blossom set. Air was given all day plentifully, but the lights were shut down in the evening for the night. To-day the water in the springs lowered the thermometer to 50.

Tuesday

Tuesday, July 9, 1793.

Hours. S.Th. P.Th. Ther. Wind.

6	77	92	60	E. Thick foggy clouds, and a brisk gale of wind.
8	84	93	70	E. Sunshine, windy.
9	70	73	72	E. Ditto.
10	82	84	74	E. Ditto.
12	95	87	76	E. Ditto.
2	92	90	75	E. Ditto.
4	90	91	73	E. Ditto.
5	82	91	72	E. Ditto.
9	—	—	61	E. Clear, and a brisk wind.

Between 8 and 9 o'clock in the morning the plants were well watered with water 67 degrees warm. It was poured all over their leaves out of wide rosed water-pots; to each three-light frame was given about a hoghead. Air was given all day, till 5 o'clock in the afternoon, when the lights were shut down for the night.

Wednesday, July 10, 1793.

Hours. S.Th. P.Th. Ther. Wind.

5	74	91	57	E. Foggy, and nearly calm.
6	77	91	62	E. The fog becomes thin.
8	84	92	71	E. Sunshine.
10	96	93	80	E. Ditto.
12	94	94	84	E. Ditto.
2	94	95	85	E. Ditto.
5	93	95	79	E. Ditto.
9	—	—	62	E. Clouds here and there.

In the morning the plants were stopped, their leaves thinned, and the fruit in blossom set. Air was given all day plentifully, and some left all night at every light.

Q 3

Thursday,

Thursday, July 11, 1793.

Hours. S.Th. P.Th. Ther. Wind.

6	77	93	65	N. E.	Cloudy in the south and west, and clear in the north and east.
8	84	93	72	N. E.	Clouds here and there.
10	94	94	80	N. E.	Sunshine, and a gentle breeze of wind.
12	100	95	82	E.	Ditto.
2	95	96	81	E.	Ditto.
5	90	96	77	E.	Clouds here and there.
7	86	95	74	E.	Ditto.
9	—	—	67	E.	Clear, and nearly calm.

In the morning the plants were stopped, their leaves thinned, and the fruit in blossom set. Air was admitted till between 5 and 6 in the afternoon, when the plants were gently watered all over their leaves with water 77 degrees warm, and then the lights were shut close down.

Friday, July 12, 1793.

Hours. S.Th. P.Th. Ther. Wind.

6	77	92	62	N. E.	Clear, and a gentle air of wind.
8	89	93	72	N. E.	Sunshine, and a brisk gale [of wind.
10	95	94	80	N. E.	Ditto.
12	92	96	85	N. E.	Ditto.
2	90	96	84	N. E.	Ditto.
4	91	96	81	N. E.	Ditto.
5	85	96	78	N. E.	Ditto.
7	78	95	72	N. E.	Ditto.
9	—	—	64	N. E.	Clear and calm.

In the morning the plants were stopped, their leaves

leaves thinned, and the fruit in blossom set. The plants were shaded with thin mats from between 11 and 12 o'clock till about half past 2 in the afternoon. Air was admitted day and night plentifully.

Saturday, July 13, 1793.

Hours. S.Th. P.Th. Ther. Wind.

5	66	90	55	E. Calm, and not a cloud to be seen.
6	67	90	57	E. Bright sunshine.
8	80	91	68	E. Sunshine, and a brisk gale of
10	84	92	80	E. Ditto. [wind.
12	87	93	82	E. Ditto.
2	88	94	81	E. Ditto.
4	90	95	79	E. Ditto.
8	72	94	65	E. Clear and calm.

In the morning the plants were stopped, their leaves thinned, and the fruit in blossom set. About 7 o'clock in the morning I poured water 68° degrees warm, against the sides of the frames all round about, to moisten and sweeten the flues. Air was admitted plentifully all day, and continued all night. The plants were shaded with thin mats, from about 12 o'clock till 2 in the afternoon. To-day we gathered ripe gooseberries for the first time this summer.

Q 4

Sunday,

Sunday, July 14, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
5	61	89	53	N. E. Bright sunshine, nearly calm. [wind.
8	76	89	65	N. E. Sunshine, and a brisk
10	90	90	74	N. E. Ditto.
12	95	91	82	N. E. Bright sunshine.
1	96	91	81	N. E. Ditto.
3	94	93	80	N. E. Ditto.
5	90	94	78	E. Ditto.
9	—	—	60	E.

The plants were shaded with thin mats from about noon till between 2 and 3 o'clock in the afternoon. Air was continued night and day.

Monday, July 15, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
5	62	88	55	E. Clear and calm.
8	80	89	68	E. Bright sunshine.
10	85	90	77	E. Ditto.
12	98	92	82	E. Light high clouds here and [there.
2	94	93	81	E. Ditto.
4	90	93	82	E. Sunshine.
9	—	—	61	E. Clear and calm.

The plants were gone over in the morning and stopped, their leaves thinned, and the fruit in blossom set. Air was given plentifully all day, and continued all night.

Tuesday,

Tuesday, July 16, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
5	63	88	53	S. E. Clear and calm.
8	87	90	73	S. Sunshine, nearly calm.
10	89	91	81	S.W. Ditto.
12	85	91	87	S.W. Thin high clouds, and a brisk gale of wind.
2	86	91	90	S.W. Sunshine.
4	85	91	87	S.W. Ditto.
7	82	92	78	S.W. Thin streaky clouds.
9	—	—	72	S. Clouds in the horizon.

In the morning the plants were stopped, their leaves thinned, and the fruit in blossom set. Between 8 and 9 o'clock in the morning I gave the plants a gentle watering with water about 65 degrees warm; it was given all over their leaves, but most was poured on above the flues. The plants were shaded with thin mats from about 11 o'clock till between 2 and 3 in the afternoon. Air was admitted all day plentifully, and some left all night. To-day we gathered raspberries and currants for the first time this season.

Wednesday, July 17, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	66	88	59	S.W. Clear, and a brisk wind.
8	78	88	68	S.W. Light flying clouds.
10	76	88	72	S.W. The air is overcast.
12	81	89	78	S.W. The sun glimmers.
2	87	90	80	S.W. Flying light clouds.
4	88	91	78	S.W. Ditto.
7	78	91	71	S.W. Clouds in the horizon; nearly calm.
9	—	—	65	S.W. The moon appears faintly.

In the morning the plants were gone over and stopped, their

their leaves thinned, and the fruit in blossom set. Plenty of air was continued day and night.

Thursday, July 18, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	70	88	60	S.W. Cloudy; there had been a shower of rain in the night.
8	75	88	64	S.W. Gloomy.
12	79	87	72	S.W. Cloudy; it looks rainy.
2	74	87	65	W. A drizzling rain.
4	73	87	64	W. It has rained gently since 2 o'clock.
6	71	87	62	W. Fair, cloudy.
9	—	—	56	W. Clear, and a brisk wind.

In the morning the plants were stopped, their leaves thinned, and the fruit in blossom set. Between 9 and 10 o'clock in the morning the plants were gently watered all over their leaves with water about 65 degrees warm. Air was continued all day, and a little left all night,

Friday, July 19, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	70	84	57	W. A heavy shower of rain,
8	71	84	58	W. Cloudy, and a brisk wind.
10	74	81	65	W. Ditto.
12	91	82	68	W. The sun glimmers.
2	90	83	72	S.W. Scattered clouds.
4	87	85	70	S.W. Ditto.
6	82	85	68	S.W. Ditto.
9	—	—	55	S.W. Clouds here and there.

In the morning the plants were stopped, their leaves

leaves thinned, and the fruit in blossom set. Between 8 and 9 o'clock in the morning the plants were well watered with water 63 degrees warm; it was poured on all over their leaves and surface of the bed, but most was let fall above the flues. But little air was admitted in the day-time, and about half past 5 in the afternoon the lights were shut close down, and covered up with double mats for the night.

Saturday, July 20, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	72	86	52	W. Cloudy, and a brisk wind,
9	75	86	59	W. Ditto.
10	82	87	63	W. Scattered great clouds.
12	79	87	59	N.W. Light showers.
2	84	88	63	N.W. Showery clouds.
4	82	88	56	N.W. Gentle showers.
6	—	—	57	N.W. Showery clouds; nearly calm.
9	—	—	52	N.W. Clear, and calm.

The frames were uncovered about 6 o'clock in the morning, and covered up just before 6 in the afternoon with double mats. In the forenoon the plants were stopped, their leaves thinned, and the fruit in blossom set. Air was admitted about 8 o'clock in the morning, and continued till about 5 in the afternoon, when the lights were shut down for the night.

Sunday,

Sunday, July 21, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	74	86	50	W. Sunshine, calm.
8	80	86	55	N.W. Clouds here and there.
10	94	88	62	N.W. Scattered smoky-like
12	88	89	65	N.W. Ditto. [clouds.
2	92	90	67	N.W. Ditto.
5	81	90	66	N.W. Cloudy, and nearly calm.
9	—	—	56	N.W. Ditto.

The frames were uncovered about 6 o'clock in the morning, and covered up in the evening with double mats. Air was given at 8 o'clock in the morning, and taken away about 5 in the afternoon.

Monday, July 22, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	79	89	54	S.W. Cloudy, and a brisk wind.
8	81	89	60	S.W. Ditto.
10	78	86	68	S.W. Ditto.
12	85	88	73	S.W. The sun glimmers.
2	82	89	73	S.W. Ditto.
4	82	89	71	S.W. Light clouds, and a brisk wind.
9	—	—	59	S.W. Cloudy, nearly calm.

The frames were uncovered at 6 o'clock in the morning, and covered up about 6 in the afternoon with double mats. In the morning the plants were flopped, their leaves thinned, and the fruit in blossom fet. Between 8 and 9 o'clock in the morning I gave to each three-light frame about half a hoghead of water, which was 60 degrees warm, and I poured it all over the leaves of the plants, and on every part of the insides of the frames. Air was given at 8 o'clock

o'clock in the morning, and taken away at 4 in the afternoon.

Tuesday, July 23, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	78	89	60	S. Thick foggy clouds come from the south.
8	82	89	66	S. Light showers.
10	83	89	68	S. Gloomy.
12	84	90	71	S.W. Ditto.
2	83	90	68	S.W. Cloudy, and nearly calm.
4	80	90	68	S.W. Ditto.
9	—	—	62	S.W. Ditto.

The frames were uncovered at 6 o'clock in the morning, and covered up in the evening with single mats. In the forenoon the plants were stopped, their leaves thinned, and the fruit in blossom set. Air was admitted in the morning, and continued day and night.

Wednesday, July 24, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	78	90	61	S.W. Thick foggy clouds come from the south-west.
8	80	90	68	S.W. Scattered light large
10	88	91	73	S.W. Ditto. [clouds.
12	95	92	79	S.W. Ditto.
1	96	92	80	S.W. Ditto.
2	99	94	78	W. Cloudy, and nearly calm.
4	94	94	78	W. Ditto.
7	—	—	71	S. Ditto.
9	—	—	67	S. Clear and calm.

The frames were uncovered at 6 o'clock in the morning,

morning, and covered up in the evening with mats. In the morning the plants were stopped, their leaves thinned, and the fruit in blossom set. Air was continued all day, and a finger-breadth left all night at every light.

Thursday, July 25, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	77	91	63	S.W. Cloudy, and a brisk wind.
8	80	91	68	S.W. Ditto.
10	86	91	72	S.W. Cloudy, and near calm.
12	85	91	78	W. Gloomy.
2	83	87	76	W. The sun glimmers.
4	83	88	78	S.W. Sunshine.
6	80	89	74	S.W. Clouds here and there.
9	—	—	63	S.W. Clear and calm.

The frames were uncovered at 6 o'clock in the morning, and then the plants were gone over and stopped, their leaves thinned, and the fruit in blossom set. Between 12 and 1 o'clock the plants were watered all over their leaves with water about 70 degrees warm. Air was given day and night plentifully.

Friday, July 26, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	68	86	60	S.W. Speckled thin clouds.
8	76	86	70	S.W. Clouds here and there.
10	82	87	73	S.W. The sun shines faintly.
12	85	88	77	S.W. Scattered clouds.
1	85	89	79	S.W. Ditto.
2	83	89	78	S.W. Ditto.
4	79	89	75	S.W. Cloudy, and nearly calm.

In the morning the plants were stopped, their leaves thinned,

thinned, and the fruit in blossom set. Air was given plentifully day and night. To-day I began to cut cucumbers from plants which were raised in the spring in a hot-bed, and planted out on a ridge of warm dung under hand-lights. The plants are remarkably strong and healthy, and have the appearance of producing a plentiful crop. The water in the springs lowered the thermometer to-day to 52. This morning we began to reap rye, and also pease.

Saturday, July 27, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	76	86	62	E. Foggy, and a brisk air of
8	73	86	62	S. E. It begins to rain. [wind.
10	67	85	61	S. E. It continues to rain.
12	66	84	71	S. E. It rains gently.
2	70	84	60	S. E. It rains heavily.
4	72	84	60	S. E. Ditto.
6	68	85	58	S. E. Ditto.
8	65	85	54	N. E. It rains a little.

Between 8 and 9 o'clock in the morning the lights were taken off the plants to let the rain fall on them, and at 1 o'clock they were put on again, and a little air admitted till 8 o'clock in the evening, when the lights were shut down for the night.

Sunday,

Sunday, July 28, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	68	83	52	N. E. Gloomy, and a few drops of rain fall.
8	74	84	57	N. E. Light showers.
10	77	84	57	N. E. Ditto.
12	79	85	63	N. E. Cloudy, and a brisk wind.
4	74	85	59	N. E. Ditto.
8	—	—	55	N. Ditto.

Air was admitted at 8 o'clock in the morning, and continued day and night.

Monday, July 29, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	63	83	50	N.W. Cloudy, and a brisk wind.
8	69	83	54	N.W. Cloudy, and nearly calm.
10	73	83	57	N.W. Ditto.
12	81	84	63	N.W. Ditto.
2	82	85	64	W. Sunshine.
3	85	85	66	W. Scattered clouds.
5	70	85	63	W. Sunshine.
9	—	—	52	W. Clear and calm.

In the morning the plants were stopped, their leaves thinned, and the fruit in blossom set. Air was continued day and night.

Tuesday,

Tuesday, July 30, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	61	82	51	S. Clear, and nearly calm.
8	70	82	57	S.W. Sunshine.
10	77	82	65	S.W. Scattered clouds.
12	84	84	70	S.W. Ditto.
2	80	84	69	S.W. Great clouds, and a brisk gale of wind.
4	79	84	70	S.W. Scattered clouds.
7	69	84	63	S.W. Ditto.

In the morning the plants were stopped, their leaves thinned, and the fruit in blossom set. Air was continued day and night.

Wednesday, July 31, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	67	82	57	S.W. Cloudy; there had been rain in the night.
8	70	82	70	S.W. Showers of rain.
10	80	82	70	S.W. The sun glimmers.
12	82	83	66	S.W. Showery.
1	84	84	73	S.W. Light clouds.
2	87	85	72	S.W. Scattered clouds.
4	86	86	69	S.W. Cloudy.
5	84	86	68	S.W. Light clouds.
8	—	—	59	S.W. Clear, and nearly calm.

In the morning the plants were gone over and stopped, their leaves thinned, and the fruit in blossom set. The linings were raised with fresh dung rather higher than the surface of the mould in the frames. Air was given plentifully till 5 o'clock in the afternoon, when the lights were shut close down, and covered up with mats for the night.

R

Thursday,

Thursday, August 1, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	71	85	52	S.W. Bright sunshine, nearly
8	80	85	59	S.W. Ditto. [calm.
10	85	86	66	S.W. Scattered small clouds.
12	88	87	73	W. Ditto.
2	88	88	73	W. Ditto.
4	86	88	72	W. Ditto.
6	79	87	68	W. Sunshine. [wind.
8	74	86	61	W. Thin clouds, and a brisk

In the morning the plants were stopped, their leaves thinned, and the fruit in blossom set. Air was admitted at 8 o'clock in the morning, and continued till 8 o'clock in the evening, when the lights were shut down for the night. The frames were uncovered about 6 in the morning, and covered up about 6 in the evening with double mats.

Friday, August 2, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	68	85	62	S.W. Clear, and a brisk wind.
8	84	86	85	S.W. Sunshine.
10	86	87	71	S.W. Scattered clouds.
12	87	87	76	S.W. Ditto.
2	96	88	75	S.W. Sunshine.
3	92	88	77	S. E. Ditto.
4	85	88	74	S. E. Ditto.
6	79	88	70	E. Ditto
8	—	—	62	E. Thin clouds.

The frames were uncovered about 6 o'clock in the morning, and covered up about 6 in the evening with

with double mats. In the morning the plants were stopped, their leaves thinned, and the fruit in blossom set. Air was given about 8 o'clock in the morning, and taken away about 6 o'clock in the afternoon.

Saturday, August 3, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.	
6	72	86	59	E.	Clouds here and there.
8	87	88	67	S. E.	Scattered clouds.
10	87	88	77	S. E.	Ditto.
12	85	88	78	S. E.	Ditto.
1	82	89	79	S. E.	Sunshine.
2	81	89	78	S. E.	Thin clouds.
4	82	89	77	S. E.	Ditto.
6	76	82	74	S. E.	Cloudy, and nearly calm.
8	—	—	69	S.	Great thundry confused-like clouds arise from every quarter.
9	—	—	66	S.	It rains and thunders, and great flashes of lightning appear.

The frames were uncovered about 7 o'clock in the morning, and covered up just before 6 in the afternoon with double mats. The plants were gone over and stopped, their leaves thinned, and the fruit in blossom set. Air was admitted at 8 o'clock in the morning, and continued till between 5 and 6 in the afternoon, when I gave the plants a plentiful watering with water 75 degrees warm, and then shut the lights down for the night.

R 1

Sunday,

Sunday, August 4, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
7	78	87	60	S.W. Thin clouds, and a brisk gale of wine.
8	82	87	66	S.W. Flying clouds, windy.
10	81	88	70	S.W. The sun glimmers.
12	83	88	71	S.W. Ditto.
1	79	88	70	S.W. Cloudy.
3	79	88	70	S.W. Ditto.
5	78	88	64	S.W. It rains gently.
8	—	—	59	S.W. Gloomy.

The frames were uncovered at 7 o'clock in the morning, and covered up between 5 and 6 in the afternoon with double mats. Air was given about 8 o'clock in the morning, and taken away about 5 in the afternoon.

Monday, August 5, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	76	87	57	S.W. A thick fog, nearly calm.
8	77	87	62	S.W. Foggy clouds.
10	82	88	67	S.W. Scattered clouds.
12	87	88	72	S.W. Sunshine.
2	89	90	73	S.W. Ditto.
4	90	90	70	S.W. Flying light clouds.
5	84	90	65	S.W. Showers of rain, and gusts of wind.
8	—	—	55	S.W. Clear and calm.

The frames were uncovered about 6 o'clock in the morning, and covered up at 6 in the evening with single mats. In the morning the plants were stopped, their

their leaves thinned, and the fruit in blossom set. Air was given a little before 8 o'clock in the morning, and continued day and night.

Tuesday, August 6, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	72	87	55	W. Clear, and a brisk wind.
8	84	87	59	W. Sunshine.
10	85	88	64	W. Scattered light clouds.
12	89	90	68	W. Sunshine.
2	87	90	72	W. Scattered small clouds.
4	89	90	72	W. Ditto.
5	82	90	68	W. Ditto.
8	—	—	60	W. Clear and calm.

The frames were uncovered at 6 o'clock in the morning, and covered up between 5 and 6 in the evening with double mats. In the forenoon the plants were stopped, their leaves thinned, and the fruit in blossom set. Air was continued till about 7 o'clock in the evening, when the lights were shut close down for the night. The dung of the linings having become rather dry and husky, I had them well watered. To-day the water in the springs lowered the thermometer to 54 degrees.

R 3

Wednesday,

Wednesday, August 7, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	75	89	52	S.W. Clear; there is a great
8	83	88	60	S.W. Sunshine. [dew,
10	85	89	67	S. E. Ditto.
12	88	90	74	S. E. The sun glimmerst through light clouds.
2	83	90	71	S. E. Cloudy; it looks rainy.
4	80	90	62	S. E. It rains and thunders.
4½	80	90	58	N. E. A heavy shower of hail and rain.
6	76	90	58	N. Gloomy. Great thick clouds come from the west, and others come from the east, and mix with them; and quickly the wind turns to the west, and then a large black cloud goes over to the east, and it becomes so dark for about a quarter of an hour, that a clear-sighted person can scarcely see to read.
7	—	—	57	W. It has rained and thundered since 6 o'clock, with strong gusts of wind accompanying.
8	—	—	56	N. E. Clear, except some clouds in the horizon.

In the morning the top of the linings was broken up about a foot deep, and well shaken, and then some fresh dung laid on the top of them, and after that plenty of water was poured upon them all round about. Air was given about 8 o'clock in the morning.

ing, and continued till 4 in the afternoon, when the lights were shut down for the night, and about 6 o'clock they were covered up with double mats. This morning we began to reap wheat, and to cut oats.

Thursday, August 8, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	74	87	56	S.W. Cloudy, and some drops
8	78	87	60	S.W. Gloomy. [rain fall.
10	77	87	64	S.W. Small drifting rain.
11	79	88	66	S.W. Cloudy, and a brisk wind.
1	87	88	71	S.W. Scattered clouds, windy.
2	84	88	71	S.W. Ditto.
4	96	90	69	S.W. Ditto.
6	88	91	64	S.W. Ditto.
8	—	—	58	S.W. Clear, and a brisk gale of wind.

The frames were uncovered at 6 o'clock in the morning, and covered a little before 6 in the afternoon with mats. In the morning the plants were stopped, their leaves thinned, and the fruit in blossom set. About 11 o'clock water about 65 degrees warm was poured all round against the sides of the frames, and on the mould above the flues. Air was given between 8 and 9 o'clock in the morning, and taken away between 3 and 4 in the afternoon.

Friday,

Friday, August 9, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	75	88	57	S.W. Flying clouds, windy.
8	80	88	62	S.W. Ditto.
10	73	83	65	S.W. Cloudy, windy.
12	80	85	69	S.W. Scattered clouds, windy.
1	90	86	70	S.W. Ditto.
2	82	87	68	S.W. Ditto.
4	85	88	67	S.W. Ditto.
7	—	—	62	S.W. Ditto.
8	—	—	58	S.W. Clear, and a brisk gale of wind.

The frames were uncovered at 6 o'clock in the morning, and covered up in the evening with double mats. Between 8 and 9 o'clock in the morning the plants were well watered all over their leaves with water 64 degrees warm. In the morning the plants were stopped, their leaves thinned, and the fruit in blossom set. Air was given in the morning, and continued day and night.

Saturday, August 10, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	77	86	61	S.W. Windy; there had been rain in the night, and a little falls this morning.
8	82	87	64	S.W. Thin flying clouds, windy.
10	80	87	67	S.W. Ditto.
12	86	88	71	S.W. Ditto.
2	85	89	70	S.W. Scattered clouds, windy.
4	84	89	72	S.W. Ditto.
5	81	89	69	S.W. Ditto.
8	—	—	57	S.W. Clouds here and there.

The frames were uncovered about 6 o'clock in the morning,

morning, and covered up just before 6 in the evening with double mats. In the morning the plants were stopped, their leaves thinned, and the fruit in blossom set. Air was continued day and night.

Sunday, August 11, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	68	85	53	S.W. Clear, and a brisk wind.
8	72	85	59	S.W. Thin streaky clouds.
11	84	86	64	S.W. Scattered thin clouds.
1	80	87	69	S.W. Ditto.
3	80	87	69	S.W. The sky is mottled.
5	82	87	67	S.W. Ditto.
8	—	—	60	S.W. Clouds in the horizon.

The frames were uncovered about 6 o'clock in the morning, and covered up in the evening with double mats. Air was continued day and night.

Monday, August 12, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	76	87	56	S.W. Thin clouds, and nearly
8	70	86	60	S.W. Ditto. [calm.
10	80	87	67	S.W. Sunshine.
12	92	90	71	S.W. Ditto.
1	98	90	70	S.W. Ditto.
2	90	91	73	S.W. Ditto.
4	88	91	73	S.W. Clouds here and there.
9	—	—	58	S.W. Ditto.

The frames were uncovered about 8 o'clock in the morning, and covered up in the evening with double mats. In the morning the plants were stopped, their leaves thinned, and the fruit in blossom set. Air was continued

continued day and night. To-day we began to cut barley, which was sown in March.

Tuesday, August 13, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.	
6	74	87	59	S. E.	Thin streaky high clouds, and a brisk wind.
8	78	88	68	S. E.	The sun shines faintly.
10	84	89	74	S.	Clouds here and there.
11	86	90	78	S.	Ditto.
12	85	90	76	S. W.	Ditto.
2	84	90	79	S. W.	Thundry-like clouds.
4	80	90	72	S. W.	The sky is overcast.
5	76	90	68	S. W.	A light shower.
8	—	—	64	S. W.	Beautiful red sky in the west.

In the morning the plants were stopped, their leaves thinned, the weeds picked out, and the fruit in blossom set. The covering was taken off about 6 o'clock in the morning, and put on a little before 6 in the afternoon. Air was continued all day, and in the evening the lights were shut down for the night.

Wednesday, August 14, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.	
6	70	88	51	S. W.	Clear, and a brisk wind.
8	80	88	58	S. W.	Scattered clouds.
10	82	89	67	S. W.	Ditto.
12	84	89	70	S. W.	Ditto.
2	85	89	72	S. W.	Clouds here and there.
4	78	89	68	S. W.	Ditto.
6	70	88	60	S. W.	Sunshine.
8	—	—	56	S. W.	The sky is overcast.

The frames were uncovered in the morning about 6 o'clock,

6 o'clock, and covered up in the evening with double-mats. In the morning the plants were stopped, their leaves thinned, and the fruit in blossom set. Air was given till 5 o'clock in the afternoon, when the lights were shut close down for the night.

Thursday, August 15, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	76	87	56	S. Gloomy, calm ; it looks rainy in the fourth-west.
8	73	87	67	S. A light shower of rain.
10	80	87	67	S. Sunshine.
12	82	87	69	S.W. Showery.
2	80	87	68	S.W. Flying clouds, windy.
4	79	87	68	S.W. Ditto.
5	78	87	64	S.W. Ditto.
8	—	—	57	S.W. Cloudy and windy.

The frames were uncovered about 6 o'clock in the morning, and covered up in the evening with double mats. Air was given about 9 o'clock in the morning, and the lights were shut close down in the evening for the night.

Friday, August 16, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	73	87	53	W. Flying clouds; windy.
8	76	87	60	W. Ditto.
10	77	87	62	W. Ditto.
12	80	87	65	S.W. Ditto.
2	84	88	64	W. The sun glimpses.
4	88	88	63	W. Ditto.
6	75	87	60	S.W. Sunshine.
8	—	—	55	S.W. Clear, and a brisk wind.

The frames were uncovered at 6 o'clock in the morning,

morning, and covered up about half past 5 in the afternoon with double mats. Air was admitted at 8 o'clock in the morning, and continued till about 5 in the afternoon, when the lights were shut close down for the night.

Saturday, August 17, 1793.

Hours. S.Th. P.Th. Ther. Wind.

6	72	85	53	S. E.	There had been rain in the night, and it rains this morning.
8	73	85	54	S. E.	Rainy and windy.
10	76	85	55	S. E.	It rains heavily.
12	82	86	54	S.W.	Showery and windy.
2	83	87	64	S.W.	Ditto.
4	80	87	60	S W.	Ditto.
6	—	—	57	S.W.	A strong gale of wind;
8	—	—	55	S,	Ditto. [gloomy,

The frames were uncovered about 6 o'clock in the morning, and covered up about 5 in the evening with double mats. The plants were gone over, their leaves thinned, the shoots stopped, and the fruit in blossom set. But little air was given in the day-time, and at 4 in the afternoon the lights were shut close down for the night. In the afternoon a layer of fresh dung was laid upon the north side lining.

Sunday,

Sunday, August 18, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	70	85	50	N.W. Cloudy, and a high wind.
8	71	85	52	N.W. Ditto.
10	80	85	57	N.W. Cloudy, windy.
1	80	86	60	N.W. The wind is fallen.
3	80	86	63	N.W. The sun glimmers.
5	78	86	59	W. Cloudy, calm.
10	—	—	53	W. Thin clouds; some drops of rain fall.

The frames were uncovered about 6 o'clock in the morning, and covered between 5 and 6 in the evening with double mats. Air was given in the day-time, but the lights were shut down all night.

Monday, August 19, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	72	85	48	S.W. Thin clouds, nearly calm.
8	76	85	57	S.W. The sun shines.
10	86	85	62	W. Clouds here and there.
12	95	87	69	W. Sunshine.
1	88	88	72	W. Ditto.
2	90	88	65	W. A light shower.
3	93	88	68	W. Scattered clouds.
6	86	88	63	S.W. Clouds here and there, nearly calm.
7	—	—	59	S.W. Showery clouds.

The frames were uncovered at 6 o'clock in the morning, and covered up at 6 in the afternoon with double mats. In the morning the plants were stopped, their leaves thinned, and the fruit in blossom set. Air was given at 8 in the morning, and taken away between 4 and 5 o'clock in the afternoon.

Tuesday,

Tuesday, August 20, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	70	85	44	S.W. Clear, and a great dew.
8	80	85	53	S.W. Sunshine.
10	82	85	58	S.W. Ditto.
12	92	86	65	S.W. Scattered little clouds.
1	90	87	67	W. The sun shines faintly.
2	84	87	67	W. Ditto.
4	82	87	67	W. Sunshine.
5	89	88	65	W. Ditto.
6	—	—	62	W. Thin clouds, nearly calm.
8	—	—	55	W. Clear and calm.

The frames were uncovered at 6 o'clock in the morning, and covered up about 6 in the afternoon with double mats. In the afternoon the plants were stopped, their leaves thinned, and the fruit in blossom set. About 4 o'clock in the afternoon, water 68 degrees warm was poured all round against the insides of the frames, to moisten the mould upon the flues. Air was given about 8 o'clock in the morning, and taken away between 4 and 5 in the afternoon.

Wednesday, August 21, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	74	86	56	S.W. Thin clouds, nearly calm.
8	74	86	58	S.W. Light foggy clouds.
10	82	86	65	S.W. Sunshine.
11	87	80	70	S.W. Ditto.
12	90	87	74	S.W. Scattered light clouds.
2	91	88	74	S.W. Sunshine.
3	93	88	73	S.W. Scattered clouds.
4	90	88	72	S.W. Mottled sky.
7	—	—	65	S.W. Thin clouds, nearly calm.
9	—	—	60	S.W. Clouds here and there; calm.

The frames were uncovered about 6 o'clock in the

the morning, and covered up in the evening with double mats. In the morning the plants were stopped, their leaves thinned, and the fruit in blossom set. Air was given at 8 o'clock in the morning, and taken away about 5 in the afternoon.

Thursday, August 22, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	75	87	56	S.W. Thin clouds, and a brisk
8	77	87	62	S.W. Ditto. [gale of wind.
10	85	87	70	S.W. The sun shines faintly.
12	88	88	76	S.W. Ditto.
2	87	88	74	S.W. Ditto.
3	84	88	73	S.W. The sky is overcast.
6	80	88	64	S.W. Ditto.
10	—	—	57	S.W. Clear, and a brisk wind.

The frames were uncovered between 6 and 7 o'clock in the morning, and covered up in the evening with double mats. In the forenoon the plants were stopped, their leaves thinned, and the fruit in blossom set. Air was admitted from 8 o'clock in the morning till about 5 in the afternoon. To-day the water in the springs lowered the thermometer to 54.

Friday, August 23, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	75	86	60	S.W. Cloudy, and a brisk wind.
8	76	86	63	S.W. Ditto.
10	77	86	67	S.W. Ditto.
12	85	86	71	S.W. A light shower.
1	90	87	73	S.W. The sun shines faintly.
2	87	87	71	S.W. Sunshine.
4	84	87	70	W. Ditto.
6	—	—	64	N.W. Ditto.
8	—	—	56	N.W. Clear, and a brisk wind.

The frames were uncovered about 6 o'clock in the morning,

morning, and covered up in the evening with mats. In the afternoon the plants were stopped, their leaves thinned, and the fruit in blossom set. Air was given at 8 o'clock in the morning, and continued day and night. To-day we made an end of harvest.

Saturday, August 24, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	70	84	52	S.W. Clear, and a brisk air of
8	74	84	57	S.W. Ditto. [wind.
10	82	85	62	W. Scattered clouds.
1	85	86	69	W. Ditto.
2	87	86	68	W. Ditto.
4	84	86	66	W. The sky is overcast.
6	80	86	61	W. Cloudy, and a brisk wind.
8	—	—	54	W. Thin clouds, nearly calm.

The frames were uncovered at 6 o'clock in the morning, and covered up in the evening with double mats. Air was continued day and night.

Sunday, August 25, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	68	83	46	W. Clear, and nearly calm.
8	76	83	52	W. Sunshine.
10	87	84	59	N.W. Scattered smoky - like
11	90	87	62	N.W. Ditto. [clouds.
1	87	87	69	N.W. Ditto.
2	90	87	68	N. Sunshine.
4	90	87	68	N. Clouds here and there.
5	87	87	65	N.E. Ditto.
9	—	—	50	S.E. Clear, and nearly calm.

The frames were uncovered about 8 o'clock in the morning. Air was continued day and night.

Monday,

Monday, August 26, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	61	81	44	S. E. Clear, and nearly calm.
8	76	83	55	S. E. Sunshine.
10	81	83	63	S. E. Ditto.
12	87	84	74	S. Thin clouds, and a brisk wind.
3	88	85	71	S. The sun shines faintly.
4	95	86	69	S.W. Ditto.
6	86	87	63	S.W. Cloudy, and nearly calm.
9	—	—	56	S.W. Cloudy, dark.

In the morning the plants were stopped, their leaves thinned, and the fruit in blossom set. Air was continued till between 3 and 4 o'clock in the afternoon, when the lights were shut close down for the night, and at 6 o'clock the frames were covered up with double mats.

The cucumber plants in the open ground are infected with the canker.

Tuesday, August 27, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	70	83	48	W. Clear, and a brisk wind.
8	78	83	55	W. Clouds here and there.
10	82	84	64	W. Flying clouds, and a brisk
12	84	85	67	W. Ditto. [wind.
2	80	85	68	W. Ditto.
4	81	85	65	W. Sunshine.
6	80	85	56	W. Clouds here and there.
9	—	—	50	W. Clear, and nearly calm.

The frames were uncovered about 6 o'clock in the morning, and covered up in the evening with double
S mats.

mats. Air was given about 8 o'clock in the morning, and continued till between 4 and 5 in the afternoon. The linings were raised all round with warm dung.

Wednesday, August 28, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	71	82	53	S.W. Cloudy, and but little
8	75	82	62	S.W. Thin clouds. [wind.
10	82	83	68	S.W. Cloudy, and a brisk wind.
12	67	77	69	S.W. Ditto.
1	86	77	73	S.W. The sun shines faintly.
2	82	78	69	S.W. Cloudy, and a brisk wind.
4	83	79	67	S.W. A very light shower.
8	—	—	57	S.W. Cloudy, and nearly calm.

The frames were uncovered about 6 o'clock in the morning, and covered up between 5 and 6 in the afternoon with double mats. In the morning the plants were stopped, their leaves thinned, and the fruit in blossom set. About 11 o'clock to the plants of each three-light frame was given nearly a hoghead of water, about 62 degrees warm; it was poured all over their leaves in imitation of a heavy shower of rain. After the watering but little or no air was admitted, and at 4 o'clock in the afternoon the lights were thus close down for the night.

Thursday,

Thursday, August 29, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	72	81	56	S.W. A thick fog, nearly calm.
8	80	82	57	N.W. Bright sunshine.
10	86	83	64	N.W. Ditto.
12	90	84	66	W. Scattered light clouds.
3	87	85	70	W. Ditto.
4	85	85	68	W. Ditto.
6	80	85	63	W. Clouds here and there.
8	—	—	54	W. Clear, calm.

The frames were uncovered about half past 6 o'clock in the morning, and covered up in the evening with double mats. In the afternoon the plants were stopped, their leaves thinned, and the fruit in blossom set. Air was given from 8 o'clock in the morning till about 4 in the afternoon.

Friday, August 30, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	77	84	54	S.W. It rains gently.
8	80	84	59	S.W. Flying light clouds.
10	83	85	65	S.W. Showery clouds.
12	80	85	68	S.W. Light showers.
1	88	85	69	S.W. Great thundery clouds.
2	84	86	68	S.W. Squally showers.
4	80	86	63	S.W. Cloudy, windy.
8	—	—	54	S.W. Clear in the east.

The frames were uncovered at 6 o'clock in the morning, and covered up in the evening with mats. In the forenoon the plants were stopped, their leaves thinned, and the fruit in blossom set.

S 2

Air

Air was given from about 8 o'clock in the morning till between 4 and 5 in the afternoon.

Saturday, August 31, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	75	85	54	S.W. Gloomy, and a brisk gale of wind.
8	77	85	59	S.W. Showery light clouds.
10	80	85	65	S.W. Cloudy, windy.
12	78	85	63	S.W. Showery.
2	81	85	62	S.W. Sunshine, windy.
4	80	85	60	S.W. Light showers, and gusts of wind.
5	77	85	57	S.W. A heavy shower for a few minutes.
7	—	—	55	W. Clear, and a brisk gale of
9	—	—	50	W. Ditto. [wind.]

The frames were uncovered at 6 o'clock in the morning, and covered up in the evening with mats. In the forenoon the plants were stopped, their leaves thinned, and the fruit in blossom set. Air was given from about 9 o'clock in the morning till between 4 and 5 in the afternoon.

Sunday,

Sunday, September 1, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	—	—	50	S.W. Gloomy ; it looks rainy.
8	73	84	52	S.W. It rains gently.
10	75	84	57	S.W. Ditto.
12	74	84	60	S.W. Ditto.
2	72	84	58	S.W. It continues to rain.
4	73	84	60	S.W. Windy, and a small rain.
9	—	—	55	S.W. Cloudy, windy, dark.

The frames were uncovered about 7 o'clock in the morning, and covered up in the evening with double mats. But little air was admitted in the day-time, and none all night.

Monday, September 2, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	74	83	52	S.W. Clear, and a brisk gale of wind.
8	75	83	59	S.W. The clouds look rainy.
10	83	84	65	S.W. Showery and windy.
12	78	84	66	S.W. Ditto.
2	80	84	67	S.W. Flying clouds, windy.
4	76	84	62	S.W. Ditto.
6	74	84	58	S.W. Squally showers.
9	—	—	50	S.W. Clear and windy.

The frames were uncovered about 6 o'clock in the morning, and covered up about 6 in the afternoon with mats. In the forenoon the plants were stopped, their leaves thinned, and the fruit in blossom set. Air was given from between 8 and 9 o'clock till about 5 in the afternoon.

Tuesday, September 3, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	70	83	52	S.W. Clear, and a strong gale of wind.
8	75	83	58	S.W. Flying clouds, windy.
10	74	83	61	W. Ditto.
12	80	84	64	W. Light showers.
2	78	84	63	W. Scattered clouds.
4	76	84	60	W. Ditto.
6	79	84	57	W. Clouds here and there.
9	—	—	48	W. Clear, and calm.

The frames were uncovered about 6 o'clock in the morning, and covered up in the evening with double mats. In the forenoon the plants were stopped, their leaves thinned, and the fruit in blossom set. Air was given about 8 o'clock in the morning, and continued all day, and a little left at each light all night.

Wednesday, September 4, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	69	82	41	W. Clear, and nearly calm.
8	73	82	48	W. Sunshine, and a brisk gale
10	80	83	52	W. Ditto. [of wind,
12	81	83	62	W. Scattered clouds.
2	82	83	61	W. Showery clouds.
4	81	84	54	W. A heavy shower for about 10 minutes.
7	—	—	49	W. Clouds here and there.
9	—	—	45	W. Clear, calm.

The frames were uncovered about 6 o'clock in the morning, and covered up in the evening with double mats. The plants were stopped, their leaves thinned, and the fruit in blossom set. Air was continued day and night,

Thursday,

Thursday, September 5, 1793.

Hours,	S.Th.	P.Th.	Ther.	Wind.
6	70	81	38	W. Clear, and nearly calm.
8	73	81	45	W. Sunshine.
10	86	82	46	W. Ditto.
11	78	83	49	W. Calm; the sun is covered with a light cloud, through which we clearly see the eclipse of him: To appearance three fourth parts of him are darkened.
12	77	83	50	W. Clear, and nearly calm.
2	85	84	60	W. Cloudy.
4	82	85	58	W. Ditto.
6	—	—	52	W. Ditto.
9	—	—	45	W. Cloudy, and nearly calm.

The frames were uncovered at 6 o'clock in the morning, and covered in the evening with mats. In the morning the plants were stopped, their leaves thinned, and the fruit in blossom set.

Friday, September 6, 1793.

Hours,	S.Th.	P.Th.	Ther.	Wind.
6	—	—	44	S.W. Cloudy, and nearly calm.
8	72	82	48	S.W. Ditto.
10	79	82	57	S.W. The sun shines faintly.
12	86	84	59	S.W. Ditto.
2	83	84	57	W. Great thundery clouds.
4	78	84	52	W. It rains and thunders.
7	—	—	45	N. Showery, nearly calm.
10	—	—	41	N. Clear, calm.

The frames were uncovered about 7 o'clock in the morning, and covered up in the evening with double mats. Air was continued day and night.

S 4

To-day

To-day I had the south side lining taken away, and a lining of fresh dung applied in its stead. The dung of the old lining was rotten and black, and but little heat in it, only a gentle warmth derived from the lining of the opposite side.

Saturday, September 7, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.	
6	—	—	33	S.W.	Clear, calm, and a white
8	70	78	38	S.W.	Sunshine. [frost.
10	76	79	48	S.W.	Bright sunshine.
11	86	81	51	S.W.	Ditto.
12	87	82	54	W.	Ditto.
2	85	82	56	W.	Ditto.
3	90	83	56	W.	Ditto.
5	84	84	55	W.	Ditto.
9	—	—	48	W.	Clear, and nearly calm.

The frames were uncovered about 7 o'clock in the morning, and covered up in the evening with double mats. In the forenoon the plants were stopped, their leaves thinned, and the fruit in blossom set. The lining that was made up yesterday, being funk, was raised with new dung. Air was continued day and night.

Sunday,

Sunday, September 8, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	—	—	50	S.W. Foggy clouds.
8	73	80	58	S.W. Light clouds.
10	76	81	65	S.W. Showery-like clouds.
12	80	81	68	S.W. The sun shines faintly.
2	82	82	70	W. Ditto.
4	82	83	67	W. Thin clouds cover the sky.
9	—	—	55	W. Clear and calm.

The frames were uncovered about 7 o'clock in the morning, and covered up in the evening with double mats. Air was continued day and night.

Monday, September 9, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	72	82	53	S.W. Cloudy, and but little
8	74	83	57	S.W. Thin clouds. [wind.
10	75	83	63	S.W. Lowery.
12	84	84	67	S.W. The sun shines faintly.
2	82	84	65	S.W. Clouds here and there.
5	80	85	63	W. Ditto.
9	—	—	54	W. Ditto.

The frames were uncovered about 6 o'clock in the morning, and covered up in the evening with double mats. In the forenoon the plants were stopped, their leaves thinned, and the fruit in blossom set. Air was continued day and night. To-day the water in the springs lowered the thermometer to 54.

Tuesday, September 10, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	—	—	52	W. Clear, and nearly calm,
7	70	84	55	W. Ditto.
10	80	84	65	W. The sun shines faintly.
12	78	84	68	W. The sky is overcast.
2	82	85	67	W. Cloudy, and nearly calm,
5	80	86	66	W. Sunshine.
6	—	—	63	N. Clouds here and there.
9	—	—	57	N. Clear, calm.

The frames were uncovered about 7 o'clock in the morning, and covered up between 5 and 6 in the afternoon with double mats. In the forenoon the plants were stopped, their leaves thinned, and the fruit in blossom set. Air was continued day and night. The south side lining, being sunk, was raised with hot dung, and then about a hoghead of water was poured on it.

About 3 o'clock in the afternoon water was poured all round the sides of the frames, and above the flues where the mould appeared dry.

Wednesday, September 11, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	71	85	48	S.W. Foggy, nearly calm,
8	75	85	55	N.W. Light foggy clouds.
10	86	86	61	N.W. Sunshine.
12	83	87	67	N.W. Flying light clouds.
3	84	87	62	N.W. Sunshine.
6	81	87	57	N. Clear, calm.
9	—	—	50	N. Ditto.

The frames were uncovered about 6 o'clock in the morning,

morning, and covered up in the evening with double mats. In the afternoon the plants were stopped, their leaves thinned, and the fruit in blossom set. Air was given plentifully in the day-time, and some at every light all night. To-day a great heat is arisen in the south side lining.

Thursday, September 12, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	—	—	46	N. A thick fog.
7	76	87	49	N. The fog begins to scatter,
8	81	87	53	N.E. The sun shines faintly.
10	88	88	60	N.E. Bright sunshine, nearly
12	92	89	66	S. E. Ditto. [calm,
2	88	90	72	S. E. Ditto.
4	83	90	69	S. E. Clouds here and there.
6	—	—	64	S. E. Ditto.
9	—	—	57	S. E. Cloudy, calm.

The frames were uncovered about 7 o'clock in the morning, and covered up in the evening with double mats. Air was given plentifully day and night.

Friday, September 13, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	—	—	56	S. Cloudy; there had been rain in the night.
7	75	88	57	S. A heavy rain.
8	76	88	60	S. E. It continues to rain.
10	83	88	64	S. E. Fair, cloudy.
12	87	89	71	S. Great towering white
2	80	89	70	S. Showery. [clouds.
4	78	89	68	S.W. Ditto.
6	75	88	63	S.W. Cloudy, and a brisk wind.
9	—	—	54	S.W. Cloudy.

The frames were uncovered about 7 o'clock in the morning,

morning, and covered up in the evening with double mats. The plants were stopped, their leaves thinned, and the fruit in blossom set. Air was continued day and night.

Saturday, September 14, 1793.

Hours. S.Th. P.Th. Ther. Wind.

6	—	—	56	S. Cloudy, and but little wind.
7	78	89	58	S. Ditto.
8	78	89	63	S. Ditto.
10	85	89	66	S. The sun glimmers.
1	90	90	69	S. Ditto.
3	80	90	67	S. Cloudy, and a brisk wind.
5	78	90	65	S. Cloudy, and nearly calm.
9	—	—	57	S. It rains fast.

The frames were uncovered about 7 o'clock in the morning, and covered up in the evening with double mats. In the forenoon the plants were stopped, their leaves thinned, and the fruit in blossom set. Air was continued day and night.

Sunday, September 15, 1793.

Hours. S.Th. P.Th. Ther. Wind.

6	—	—	55	S.W. Cloudy; there had been rain in the night.
8	78	89	59	S.W. Cloudy, and a brisk wind.
10	84	89	68	S.W. Scattered great clouds.
11	86	90	69	S.W. Ditto.
1	83	90	65	S.W. Clouds here and there.
2	83	90	68	S.W. Large clouds with white
4	90	91	92	S.W. Sunshine. [edges.
9	—	—	55	S.W. Showers of rain.

The frames were uncovered about 7 o'clock in the morning,

morning, and covered up in the evening with double mats. Air was continued till about 3 o'clock in the afternoon, when the lights were shut close down for the night.

Monday, September 16, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	75	88	50	S.W. Cloudy ; there had been rain in the night.
8	76	88	54	S.W. Sunshine.
10	78	88	58	S.W. Heavy showers.
12	77	88	59	S.W. Showery.
2	94	89	64	S.W. Sunshine.
4	83	89	60	S.W. Ditto.
7	—	—	51	S.W. Clear and calm.
9	—	—	48	S.W. Ditto.

The frames were uncovered about 6 o'clock in the morning, and covered up about 5 in the afternoon with double mats. The plants were stopped, their leaves thinned, and the fruit in bloffom set. Air was given about 8 o'clock in the morning, and continued day and night.

Tuesday,

Tuesday, September 17, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	—	—	44	S.W. Clear, and nearly calm.
7	73	88	49	S.W. Sunshine.
9	76	88	54	S.W. Ditto.
10	80	88	59	S.W. Clouds here and there.
12	83	88	63	S.W. Cloudy.
2	78	88	62	S.W. Showery.
4	77	88	58	S.W. Ditto.
6	74	88	56	S. Ditto.
9	—	—	56	S. Windy, and a small rain.

The frames were uncovered about 7 o'clock in the morning, and covered in the evening with double mats. In the afternoon the plants were stopped, their leaves thinned, and the fruit in blossom set. Air was continued day and night.

Wednesday, September 18, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	—	—	58	S. Gloomy; there had been rain in the night.
8	77	88	63	S.W. Cloudy, and a brisk wind.
10	79	88	65	S.W. A drifting rain.
12	80	88	69	S.W. Gloomy, nearly calm.
2	79	88	65	S.W. Light showers.
4	77	88	65	S.W. It rains fast.
5	74	88	59	N. The wind turns suddenly, and blows hard, and it rains heavily.
6	—	—	56	N. It continues to rain.
9	—	—	54	N. Fair, cloudy.

The frames were uncovered between 7 and 8 o'clock in the morning, and covered up about 5 in the
the

the afternoon with double mats. Air was continued day and night.

Thursday, September 19, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	—	—	47	N. E. Clear, and a brisk wind.
7	75	88	48	N. E. The sky is overcast.
9	80	88	53	N. E. Thin clouds.
10	81	88	54	N. Cloudy, and a brisk wind.
12	75	88	55	N. Ditto.
2	76	88	54	N. Ditto.
4	77	88	53	N. Cloudy, and nearly calm.
6	74	88	50	N. Ditto.
9	—	—	47	N. Ditto.

The frames were uncovered at 7 o'clock in the morning, and covered up in the evening with about two inches thick of hay and mats. In the forenoon the plants were stopped, their leaves thinned, and the fruit in blossom set. Air was continued day and night.

Friday, September 20, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	—	—	46	N. Cloudy, gloomy.
8	79	88	49	N. Ditto.
10	81	89	57	N. Light clouds.
12	82	90	56	N. E. A shower of rain.
2	90	90	57	N. E. Sunshine.
4	75	88	55	N. E. Cloudy, and a brisk wind.
6	76	88	51	N. E. Light clouds.
9	—	—	45	N. E. Clear, and a brisk wind.

The frames were uncovered about 8 o'clock in the morning, and covered up in the evening with about three

three inches thick of hay and mats. In the forenoon the plants were stopped, their leaves thinned, and the fruit in blossom set.

About 4 o'clock in the afternoon I gave to each three-light frame of plants nearly half a hoghead of water, warmed to about 83 degrees. It was poured all over their leaves, and every part of the inside of the frames was well washed therewith. The lights were then shut close down for the night.

Saturday, September 21, 1793.

Hours. S.Th. P.Th. Ther. Wind.

6	—	—	38	N. E. Showery ; a rainbow in in the west.
7	78	89	41	N. E. Sunshine, and a brisk
9	82	89	48	N. E. Ditto. [wind.
10	81	89	52	N. E. Clouds here and there.
12	85	90	54	N. E. It rains.
2	88	91	53	N. E. Sunshine.
3	84	91	44	N. E. A shower of hail.
4	80	90	45	N. E. Showery.
6	75	89	43	N. E. Clouds here and there.
9	—	—	40	N. E. Ditto.

The frames were uncovered about 7 o'clock in the morning, and covered up in the evening with hay and mats. In the forenoon the plants were stopped, their leaves thinned, and the fruit in blossom set. Air was given about 8 o'clock in the morning, and continued day and night.

Sunday,

Sunday, September 22, 1793.

Hours. S.Th. P.Th. Ther. Wind.

6	—	—	40	N. Cloudy; there had been rain in the night.
8	76	89	43	N. A small rain.
10	74	89	46	N. It rains.
12	75	89	46	N. Ditto.
2	74	88	46	N. It continues to rain fast.
4	72	88	45	N. Ditto.
6	68	88	43	N. Ditto.
9	—	—	40	N. Clear, and nearly calm.

The frames were uncovered about 8 o'clock in the morning, and covered up in the evening with hay and mats. But little air was given in the day-time, and in the evening the lights were shut close down for the night.

Monday, September 23, 1793.

Hours S.Th. P.Th. Ther. Wind.

6	—	—	40	S.W. Cloudy, and but little
8	76	87	43	S.W. Ditto. [wind.
10	79	87	48	S.W. Ditto.
12	77	88	50	S.W. Ditto.
2	76	88	50	S.W. Ditto.
3	75	88	48	S.W. A shower of rain.
5	74	88	48	S.W. The sun glimpses.
9	—	—	44	S.W. Clear, and nearly calm.

The frames were uncovered about 8 o'clock in the morning, and covered up about 5 in the afternoon with about three inches thick of hay and mats. In the forenoon I stopped the plants, thinned their leaves, cut off several small fruit where they were too thick,

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and

and set the fruit in blossom. Air was given about 9 o'clock in the morning, and taken away about 5 in the evening. The linings being sunk were raised with fresh dung.

Tuesday, September 24, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	—	—	42	S.W. Cloudy, and a brisk air of
8	76	87	50	S.W. Ditto. [wind.
10	80	87	54	S.W. Sunshine.
12	85	88	56	S.W. The sun shines faintly.
1	84	88	59	S.W. Ditto.
2	82	88	58	S.W. Showery.
5	77	88	54	S.W. Gloomy.
9	—	—	50	S.W. It rains heavily.

The frames were uncovered a little before 8 o'clock in the morning, and covered up in the evening with about three inches thick of hay and mats. The plants were stopped, their leaves thinned, and the fruit in blossom set. Air was admitted about 9 o'clock in the morning, and continued day and night.

Wednesday, September 25, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	—	—	45	N.W. A thick fog.
8	74	88	48	N.W. The fog begins to scatter.
10	81	88	52	N.W. Sunshine.
12	95	90	58	N.W. Ditto.
1	100	91	60	N.W. Scattered clouds.
2	94	92	58	N.W. Ditto.
5	100	92	58	N.W. Ditto.
6	84	92	54	N.W. Ditto.
9	—	—	43	N.W. Clear, calm.

The frames were uncovered a little before 8 o'clock in

in the morning, and covered up in the evening with hay and mats. The plants were stopped, their leaves thinned, and the fruit in blossom set. Air was continued day and night.

Thursday, September 26, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	—	—	35	N. Clear and calm.
8	74	89	41	N. Sunshine.
10	85	89	51	N. Scattered clouds.
12	82	89	61	S.E. Ditto.
2	90	90	59	S.E. Bright sunshine.
4	85	91	56	S.E. Ditto.
9	—	—	43	S.E. Clear and calm.

The frames were uncovered about 8 o'clock in the morning, and covered up between 5 and 6 in the evening with hay and mats. In the forenoon I stopped the plants, thinned their leaves, and set the fruit in blossom. Air was continued night and day.

Friday, September 27, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	—	—	35	S.W. Foggy.
8	74	89	43	S.W. The fog becomes thin.
10	81	89	50	S.E. Sunshine.
12	86	90	57	S.E. Ditto.
2	90	91	57	S.E. Ditto.
4	83	91	55	S.E. Ditto.
6	—	—	49	E. Clear, and nearly calm.
9	—	—	43	E. Ditto.

The frames were uncovered about 8 o'clock in the morning, and covered between 5 and 6 in the afternoon with hay and mats. In the forenoon the plants

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were stopped, their leaves thinned, and the fruit in blossom set. About 11 o'clock, water 80 degrees warm was poured all round against the sides of the frames, and on the mould above the side flues. Air was continued day and night.

Saturday, September 28, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	—	—	49	E. Foggy, nearly calm.
8	76	89	49	E. Ditto.
10	80	89	54	E. Sunshine.
12	85	90	58	E. Ditto.
2	86	91	59	E. Ditto.
4	78	91	55	E. Ditto.
6	—	—	49	E. Clear, and nearly calm.
9	—	—	43	E. Ditto.

The frames were uncovered about 8 o'clock in the morning, and covered up a little before 6 in the evening with hay and mats. Air was continued day and night.

Sunday, September 29, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	—	—	42	E. Foggy.
8	78	89	50	E. The fog becomes thin.
10	87	89	58	S.E. The sun shines faintly.
11	84	89	62	S.E. Ditto.
1	80	90	64	S.E. Ditto.
2	82	90	60	S. Cloudy.
5	75	90	55	S. Gloomy, nearly calm.
9	—	—	46	S. Cloudy, dark.

The frames were uncovered about 8 o'clock in the morning, and covered up in the evening with hay and mats. Air was continued day and night.

Monday,

Monday, September 30, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	—	—	47	S.W. Clear, and nearly calm.
8	75	90	50	S.W. Cloudy, and a brisk wind.
10	78	90	56	S.W. Ditto.
12	83	90	59	S.W. Scattered clouds.
2	76	90	57	S.W. Ditto.
4	72	90	54	S.W. Ditto.
9	—	—	46	S.W. Cloudy, dark,

The frames were uncovered about 8 o'clock in the morning, and covered in the evening with hay and mats. In the forenoon I stopped the plants, thinned their leaves, and set the fruit in blossom. Air was continued day and night.

Tuesday, October 1, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	—	—	47	S.W. Rainy morning.
8	73	88	57	S.W. Flying clouds, windy.
10	75	88	64	S.W. Ditto.
12	75	88	65	S.W. Showers of rain.
2	72	87	61	S.W. Ditto.
5	72	87	57	S.W. Clear, and a brisk wind.
9	—	—	52	S.W. Cloudy and windy.

The frames were uncovered about 8 o'clock in the morning, and covered up in the evening with hay and mats. Air was continued day and night.

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Wednesday,

Wednesday, October 2, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	—	—	45	S.W. Clear, and a brisk wind.
8	71	86	49	S.W. Sunshine, windy.
10	76	86	56	S.W. Ditto.
12	79	86	62	S.W. Scattered clouds.
2	70	87	46	N.W. A shower, a high gust of wind, and loud claps of thunder.
4	68	87	52	N.W. Scattered clouds.
5	68	87	46	N.W. A shower of hail.
9	—	—	43	N.W. Clear, and but little wind.

The frames were uncovered about 8 o'clock in the morning, and covered up in the evening with hay and mats. In the forenoon the plants were stopped, their leaves thinned, and the fruit in blossom set. Air was continued day and night.

Thursday, October 3, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	—	—	45	S.W. Cloudy, and a brisk wind.
8	69	84	52	S.W. Ditto.
10	78	84	60	S.W. Ditto.
12	80	85	60	W. Ditto.
2	72	85	63	W. Ditto.
4	73	85	59	W. Ditto.
9	—	—	52	W. Cloudy, dark.

The frames were uncovered about 8 o'clock in the morning, and covered up in the evening with hay and mats. The plants were stopped, their leaves thinned, and the fruit in blossom set. Air was continued day and night.

Friday,

Friday, October 4, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	—	—	50	S.W. Cloudy, windy.
8	72	84	55	S.W. Ditto.
10	74	84	61	S.W. Flying clouds.
12	73	80	67	S.W. Ditto.
2	70	80	66	W. Ditto.
4	77	80	65	S.W. The sky is overcast.
5	75	81	60	S.W. Ditto.
9	—	—	55	S.W. Cloudy, dark.

The frames were uncovered about 8 o'clock in the morning, and covered up in the evening with hay and mats. In the forenoon I cut the greatest part of the shoots of the plants off, and I had all the mould taken off the side flues. The remaining shoots or branches of the plants were divested of the greatest part of their leaves, and about two inches thick of fine fresh leaf mould laid among them. The shoots were then laid down with their joints among the fresh mould, and fixed with small wooden pegs. The flues were then swept clean with a hair hand broom, and the plants were watered moderately all over their leaves, with water about 82 degrees warm.

Saturday, October 5, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	—	—	53	S.W. Cloudy and gloomy.
8	80	84	57	S.W. Ditto.
10	79	84	60	S.W. Cloudy, and a brisk wind.
12	80	84	63	S.W. The sun shines faintly.
2	85	85	64	S.W. Ditto.
3	90	85	63	S.W. Ditto.
4	86	86	62	S.W. Ditto.
9	—	—	52	S.W. Clear, and nearly calm.

The frames were uncovered about 8 o'clock in the

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morning,

morning, and covered up in the evening with hay and mats. Air was continued day and night. To-day I sowed cucumber seeds in leaf mould about three inches deep in a pan, and I set it in the cucumber frame on the north side flue in the middle light of the middle frame, about one foot north of the thermometers ; the seeds are of this year's sowing.

Sunday, October 6, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	—	—	52	S.W. Cloudy, and a brisk wind.
8	78	84	58	S.W. Ditto.
10	79	84	61	S.W. The sun glimpses.
12	86	85	65	S.W. Ditto.
1	90	86	65	S.W. Thin clouds cover the sky.
3	80	86	66	S.W. Ditto.
5	79	86	60	S.W. Gloomy.
9	—	—	49	S.W. Clear, and nearly calm.

The frames were uncovered about 8 o'clock in the morning, and covered up in the evening with about four inches thick of hay and mats. Air was continued till 5 o'clock in the evening, when the lights were shut down for the night.

Monday, October 7, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	—	—	45	S.W. Light clouds, but little
8	80	85	50	S.W. Sunshine. [wind.
10	84	85	60	S.W. Ditto.
12	90	86	61	S.W. Light clouds cover the
2	101	87	59	S.W. Sunshine. [sky.
4	89	88	57	S.W. Ditto,
6	—	—	52	W. Clear, and a brisk wind.
9	—	—	49	W. Ditto.

The frames were uncovered about 8 o'clock in the morning, and covered up in the evening with hay and mats. Air was given about 9 o'clock in the morning, and at 1 o'clock the plants, flues, and every part of the frames were sprinkled with water 85 degrees warm, and the lights shut close down for the night. The feeds that were sown on Saturday appear double coming through the mould. To-day the dung of the north side lining was taken away, and a lining of fresh dung put in its stead.

Tuesday, October 8, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	—	—	46	W. Clear, and a brisk wind.
8	78	83	51	W. Clouds here and there.
10	77	83	57	W. Ditto.
12	79	83	61	W. Cloudy.
2	76	83	61	W. Ditto.
4	72	83	58	W. Ditto.
9	—	—	53	W. Ditto.

The frames were uncovered about 8 o'clock in the morning,

morning, and covered up in the evening with hay and mats. Air was given from about 9 o'clock in the morning till 5 in the evening. The seedling plants are up, and their leaves begin to expand.

Wednesday, October 9, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.	
6	—	—	52	W.	Cloudy, nearly calm.
8	79	83	55	W.	Gloomy.
10	80	83	58	W.	Thin clouds.
12	90	84	62	S.W.	Sunshine.
2	91	85	64	S.W.	Ditto.
4	86	86	59	S.W.	Ditto.
5	80	86	55	S.W.	Clear, and nearly calm.
9	—	—	50	S.W.	Foggy.

The frames were uncovered about 8 o'clock in the morning, and covered up in the evening with hay and mats. The plants were stopped, their leaves thinned, and some showing fruit nipped off. The plants, from the seeds which were sown last Saturday, were planted in pots in leaf mould, three plants in each pot, and set in a row on the north side flue.

Thursday, October 10, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.	
6	—	—	41	S.E.	Misty.
8	81	86	47	S.	Sunshine.
12	86	87	62	S.W.	Ditto.
2	83	87	65	S.W.	Ditto.
4	80	86	62	S.W.	Clouds cover the sky.
9	—	—	53	S.W.	Cloudy, dark.

The frames were uncovered between 7 and 8 o'clock

6 o'clock in the morning, and covered up in the evening with single mats. Air was given at 8 o'clock in the morning, and continued day and night. The plants were shaded for about two hours in the hottest time of the day. About 4 in the afternoon the plants, flues, and every part of the insides of the frames were watered with water about 80 degrees warm. The linings were raised with fresh dung.

Friday, October 11, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	—	—	50	S.W. Cloudy, nearly calm.
7	70	84	51	S.W. Gloomy.
8	71	84	52	S.W. Ditto.
10	73	83	55	S.W. Ditto.
12	79	83	59	S.W. Hazy.
1	81	84	60	S.W. Ditto.
2	81	85	60	S.W. Ditto.
4	80	85	59	S.W. Ditto.
5	79	85	58	S.W. Ditto.
9	—	—	54	S.W. Cloudy, dark.

The frames were uncovered about 7 o'clock in the morning, and covered up in the evening with mats. Air was continued day and night.

Saturday,

Saturday, October 12, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	—	—	53	S. E. Foggy, nearly calm,
7	79	85	54	S. E. Ditto.
10	85	85	62	S. E. Light clouds.
12	90	87	67	S. E. Sunshine.
1	91	87	67	S. E. Ditto.
2	95	88	68	S. E. Ditto. [there.
4	83	88	64	S. E. Light clouds here and
9	—	—	56	S. E. Clear, and nearly calm.

The frames were uncovered about 7 o'clock in the morning, and covered up in the evening with mats. Air was continued day and night. In the forenoon the plants were stopped, their leaves thinned, and the fruit in blossom set.

Sunday, October 13, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	—	—	50	S. W. Clear, and nearly calm.
8	77	86	55	S. W. Light foggy clouds.
10	80	86	60	S. W. Ditto.
11	87	86	66	S. W. Sunshine.
1	85	87	64	S. W. Ditto.
2	86	87	63	S. W. Ditto.
4	77	86	59	S. W. Light clouds, nearly calm.

The frames were uncovered about 8 o'clock in the morning, and covered up in the evening with mats. The first rough leaves of the seedling plants, which were sown the 5th instant, are fairly expanded.

Monday,

Monday, October 14, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	70	83	52	S. Hazy.
8	72	83	52	S. Ditto.
10	76	83	59	N.W. Ditto.
12	81	84	62	N.W. The sun glimmers.
2	85	85	60	N. Cloudy.
4	78	85	57	N. Light clouds.
9	—	—	46	N. Clear, nearly calm.

The frames were uncovered about 6 o'clock in the morning, and covered up in the evening with mats. The plants were stopped, their leaves thinned, and the fruit in blossom set. In the morning, about 8, plenty of cold water was poured on the flues, and the plants were gently watered with water about 78 degrees warm, but not over their leaves. The flues were watered again in the evening. Air was continued night and day.

Tuesday, October 15, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	—	—	33	S.W. Clear, and a white frost.
8	64	80	37	S.W. Sunshine.
10	79	80	44	S.W. Ditto.
12	84	82	50	W. Ditto.
2	97	85	54	W. Ditto.
4	84	86	51	W. Ditto.
9	—	—	50	W. Mottled sky.

The frames were uncovered between 7 and 8 o'clock in the morning, and covered up in the evening with mats. Air was continued day and night.

Wednesday,

Wednesday, October 16, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	—	—	50	W. Cloudy, and nearly calm.
7	73	84	50	N. Ditto.
8	70	83	51	W. Clouds here and there.
10	84	84	54	W. Sunshine.
12	85	85	58	W. Ditto.
2	95	86	57	W. Ditto.
4	80	86	55	W. Ditto.
9	—	—	46	W. Clear, nearly calm.

The frames were uncovered about 7 o'clock in the morning, and covered up in the evening with mats. The plants were stopped, their leaves thinned, and the fruit in blossom set. At noon the flues were well watered with cold water, and the young plants in pots were watered with water about 80 degrees warm. Air was continued night and day.

Thursday, October 17, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	—	—	43	W. Light clouds.
8	74	82	47	W. Hazy.
10	77	83	52	W. Ditto.
12	84	84	59	N.W. Ditto.
2	80	84	58	N.W. Ditto.
4	76	84	56	N. Ditto.
5	72	84	55	N. Ditto.
9	—	—	52	N. Cloudy, dark.

The frames were uncovered about 8 o'clock in the morning, and covered up in the evening with mats. Air was continued day and night. The north side lining, being funk, was raised with hot dung.

Friday,

Friday, October 18, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	—	—	42	W. Mifty, nearly calm.
8	67	80	45	W. Gloomy.
10	70	80	50	W. Ditto.
12	75	80	55	W. Ditto.
1	75	81	57	W. Ditto.
2	72	81	54	W. Ditto.
4	71	81	53	W. Ditto.
9	—	—	50	W. Cloudy.

The frames were uncovered about 8 o'clock in the morning, and covered up in the evening with mats. In the forenoon I stopped the plants, thinned their leaves, and set the fruit in blossom. Air was continued day and night. The young plants have their second rough leaves fairly expanded.

Saturday, October 19, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	—	—	42	W. Mifty, nearly calm.
8	71	81	50	W. Cloudy.
10	72	81	51	W. Ditto.
12	75	81	54	W. Ditto.
2	72	81	55	W. Ditto.
4	72	81	53	W. Ditto.
5	68	80	51	W. Ditto.
9	—	—	50	W. Light clouds.

The frames were uncovered at 8 o'clock in the morning, and covered up in the evening with hay and mats. Air was continued day and night. The plants were stopped, and the fruit in blossom set. The young plants were stopped for the first time; they

they are strong and healthy, but rather long flanked.

Sunday, October 20, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
7	—	—	49	W. Cloudy.
8	69	80	50	W. Light clouds.
10	73	80	55	W. Ditto.
11	75	80	57	W. Cloudy, and a brisk gale of
1	74	80	57	W. Ditto. [wind.
3	73	80	55	W. Ditto.
5	70	80	52	W. Ditto.
9	—	—	50	W. Ditto.

The frames were uncovered at 8 in the morning, and covered up in the evening with hay and mats. Air was continued till between 4 and 5 in the afternoon, when the lights were shut down for the night.

Monday, October 21, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
7	—	—	45	W. Clear in the west, cloudy in
8	78	83	45	W. Sunshine. [the east,
10	82	84	52	W. Ditto.
12	90	85	57	W. Ditto.
2	80	85	57	W. Ditto.
4	82	85	57	W. Clouds here and there.
9	—	—	50	W. Ditto.

The frames were uncovered a little before 8 in the morning, and covered up in the evening with hay and mats. The plants were stopped, their leaves thinned, and the fruit in blossom set. Air was given at 9 o'clock, and continued day and night. About noon the young plants were watered and shaded for
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about one hour ; at 4 o'clock plenty of cold water was poured on the flues. The linings, being sunk, were raised with fresh dung and watered. Having prepared a nine-light bed for the young cucumber plants, to-day I had linings put to it. To the north side of the bed an entire new lining was applied, but to the ends and south side only half a lining of new dung was applied, that is, about twenty inches of rotten dung was suffered to remain in the foundation of the south side and end linings, so that the height of fresh dung laid on was only about twenty inches. The dung applied to the north side had lain in a ferment for some days, but that of the south side was fresh from the stables.

Tuesday, October 22, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	—	—	49	W. Cloudy, nearly calm.
7	80	85	49	W. Ditto.
8	78	85	51	W. Ditto.
10	78	85	53	E. Hazy.
12	76	85	60	E. Ditto.
1	82	85	58	E. Ditto.
2	81	85	57	E. Gloomy.
4	75	85	54	E. Ditto.
9	—	—	59	E. Cloudy.

The frames were uncovered about 7 o'clock in the morning, and covered up in the evening with about two inches thick of hay and mats. In the morning the plants were stopped, their leaves thinned, and the fruit in blossom set. The end linings were taken down about twenty inches, and made up with hot dung.

ding. The bed for the young plants was covered up in the evening, five or six inches thick with hay and mats.

Wednesday, October 23, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	—	—	46	E. Hazy.
8	80	85	48	E. Ditto.
10	81	85	53	E. Light clouds.
12	84	86	58	S. E. Ditto.
2	87	86	55	S. E. Sunshine.
4	78	86	52	S. E. Light clouds.
9	—	—	44	S. E. Ditto.

The frames were uncovered about 8 o'clock in the morning, and covered up in the evening with about two inches thick of hay and mats. Air was given day and night. About half an inch thick of fine mould was laid on the surface of the bed among the branches of the plants. The shoots of the plants are run thick and strong to the sides of the pits, and some of them are run upon the tiles of the flues. In the afternoon cold water was poured plentifully on the flues.

Thursday, October 24, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	—	—	34	S. E. Clear, and nearly calm.
8	74	83	38	S. E. Sunshine.
10	84	84	44	S. Ditto.
12	80	84	51	S. W. Thin clouds.
2	74	84	51	S. W. Ditto.
4	73	83	49	S. W. Ditto.
5	68	83	48	S. W. Ditto.
7	—	—	44	S. W. It rains a little.

The frames were uncovered about 8 o'clock in the morning,

morning, and covered up in the evening with about three inches thick of hay and mats. The air in the frames of the bed, to which a lining was applied on Monday last, being come to a proper degree of heat this afternoon, I planted the plants in it: In doing which I turned them out of the pots with their balls whole, and set three plants in each hill, covering their balls with fine mould, three inches up the stems of the plants above the surface of their balls. In the evening the lights of these frames were covered up after the same manner as that of the old bed. The young plants just planted are beginning to break forth their shoots after the first stopping.

Friday, October 25, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	—	—	45	S.W. Hazy.
8	77	84	47	S.W. Ditto.
10	75	83	52	S.W. The sun appears faintly through lofty clouds.
12	79	84	56	S.W. Brisk gale of wind; it rains lightly.
2	72	83	53	S.W. Fair, cloudy, windy.
4	68	83	52	S.W. Ditto.
9	—	—	46	S.W. Cloudy, and a strong gale of wind.

The frames were uncovered about 8 o'clock in the morning, and covered up in the evening with about three inches thick of hay and mats. In the forenoon the plants were stopped, their leaves thinned, and the fruit in blossom set. Air was given about 9 o'clock in the morning, and taken away between 4 and 5 in the afternoon. The air in the frames of the new

put out plants was kept to nearly the same degree of heat as above. The plants look well.

Saturday, October 26, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	—	—	55	S.W. Cloudy, and a strong gale
8	80	85	57	S.W. Ditto. [of wind.
10	78	85	58	S.W. Ditto.
12	80	85	59	S.W. Ditto.
2	76	84	58	S.W. Ditto.
4	70	84	57	S.W. Ditto.
5	74	84	56	S.W. The clouds look rainy.
9	—	—	50	S.W. Drizzling rain.

The frames were uncovered a little before 8 o'clock in the morning, and covered up in the evening with hay and mats. Between 4 and 5 o'clock in the afternoon the flues and mould close adjoining to them were watered with cold water, and then the lights were shut down for the night.

Sunday, October 27, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	—	—	50	S.W. Cloudy, and but little wind.
8	81	86	53	S.W. Some drops of rain fall.
10	76	86	55	S.W. Small rain.
12	80	86	58	S.W. The sun glimmers.
1	78	86	58	S.W. Cloudy.
2	75	85	57	S.W. Ditto.
4	72	85	53	S.W. Clouds here and there.
9	—	—	44	S.W. Clear, and nearly calm.

The frames were uncovered about 8 o'clock in the morning, and covered up in the evening with hay and mats.

mats. Air was given at 8 o'clock in the morning, and continued day and night.

Monday, October 28, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	—	—	36	S.W. Clear, and but little wind.
8	76	85	39	S.W. Ditto.
10	80	85	44	S.W. Sunshine.
12	85	85	52	S.W. Ditto.
1	91	86	52	N.W. Ditto.
3	90	86	51	N.W. Ditto.
4	75	85	50	N.W. Ditto.
9	—	—	37	N.W. Clear, and nearly calm.

The frames were uncovered about 8 o'clock in the morning, and covered up in the evening with about two inches thick of hay and mats. The plants were stopped, their leaves thinned, and the fruit in blossom set. Air was continued day and night.

Tuesday, October 29, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	—	—	44	S.W. The sky is red a good way up the horizon.
8	70	83	47	S.W. Cloudy, and a brisk gale
10	72	83	53	S.W. Ditto. [of wind.
12	75	83	54	S.W. Ditto.
2	70	83	54	S.W. Ditto.
4	68	82	52	S.W. Gloomy, windy; the clouds look rainy.
7	—	—	51	S.W. It rains.
9	—	—	51	S.W. It rains heavily.

The frames were uncovered about 8 o'clock in the morning, and covered up in the evening with hay
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and mats. Air was given in the day-time, but the lights were shut down during the night.

Wednesday, October 30, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	—	—	32	S.W. Clear; there had been a heavy rain in the night.
8	70	83	34	S.W. Sunshine, but little wind.
10	76	83	37	S.W. Ditto.
12	80	83	42	S.W. Flying light clouds.
2	75	83	42	S.W. Clouds here and there.
4	70	83	40	S.W. A light shower.
9	—	—	33	S.W. Clear, and nearly calm.

The frames were uncovered about 8 o'clock in the morning, and covered up in the evening with hay and mats. Air was given at 9 o'clock in the morning, and continued till evening.

Thursday, October 31, 1793.

Hours.	S.Th.	P.Th.	Ther.	Wind.
6	—	—	28	S.W. Clear, and nearly calm.
8	74	83	30	S.W. Ditto.
10	79	83	34	S.W. Sunshine.
12	84	84	37	W. Ditto.
2	81	84	42	N.W. Ditto.
4	72	84	36	N.W. Clouds here and there.
5	70	84	32	N. Clear, and nearly calm.
9	—	—	29	N. Ditto.

The frames were uncovered at 8 o'clock in the morning, and covered up about 5 in the evening with hay and mats. In the morning the linings were raised with dung fresh from the stables. About noon the plants were stopped, their leaves thinned, and

and the fruit in blossom set, and the mould adjoining to the flues was watered with water about 80 degrees warm. The young plants were watered and stopped the second time. Air was given a little before 9 in the morning, and taken away in the evening.

TO carry on farther the account of the management of the plants would be superfluous. I have cut fruit from them in ten months of the year, and since they were cut in, their shoots laid, and the flues cleared of mould, which was done on the 4th day of October, the plants have struck root afresh, and are now, this 31st day of October, in a vigorous, healthy, flourishing state, with fruit showing plentifully, and some set; and if the weather prove favourable, perhaps fruit may be cut from them in November and December, and, by good management, they may be enabled to continue producing fruit during the greatest part of the year 1794.

From the 2d of October 1793 to the 25th of January 1794, not the smallest grain of snow was perceived to fall at this place, and during that time but very little wind was stirring. On the 25th of January the wind from the west rose very high, and about 1 o'clock some snow fell, and the mercury in the thermometer sunk to 27.

Sunday, January 26, was clear all day, and a strong gale of wind blew from the west.

Monday, January 27, 1794.

Hours.	S.Th.	Ther.	Wind.	
5	—	25	E.	It begins to snow, and the wind is boisterous.
7	—	27	E.	The ground is covered with snow about 7 inches thick.
8	—	30	S.	The snow lies on the earth about 10 inches thick.
9	75	32	W.	Fair, windy.
10	69	30	W.	Sleet falls.
12	61	25	N.W.	It snows, and the wind is exceeding high: It blows quite a tempest.
2	67	30	N.W.	Clear, the wind is fallen.
4	61	26	N.W.	Clear, and a brisk wind.
8	—	21	N.W.	Clear, and nearly calm.

The frames were uncovered at 9 o'clock in the morning, and covered about 4 in the evening with about three inches thick of hay and mats. Air was continued day and night at every light,

THE following Hints and Observations on Agriculture are the lucubration of many days, but I did not think of publishing them till the month of January 1794, and had not certain unexpected occurrences come in the way, unforeseen, and consequently unprovided for, they probably would have for ever remained in oblivion.

It was in the beginning of November 1793 that I carried the foregoing account of the Culture of the Cucumber to the printer, desiring to have it printed by the beginning of January 1794, but he told me he could not finish it before the month of February, which he said would be a good time for its publication. The second proof sheet did not come to my hand till January, which however convinced me that the copy would not make so many pages as I expected, nor such a number, as, by the advice of the printer, I had previously purchased paper for. I therefore resolved to add as much as might make up the stipulated number; and being unwilling for the present to publish any more of my works on gardening, I set about correcting my writings concerning the art of agriculture, it having occurred to me that something relative to husbandry might become useful to some gardeners into whose hands my treatise on the

the Culture of the Cucumber was likely to fall, and who may have occasion to undertake the direction and oversight of gentlemen's farms together with that of their gardens.

A good gardener, possessed of extensive ideas with steady application, will soon learn to be a good farmer.

HINTS, OBSERVATIONS, &c.

ON THE

IMPROVEMENT OF AGRICULTURE.

THE art of agriculture has been cultivated by many great men among the ancients, and it has been treated of by their most celebrated authors. Its history, rise, and progress, may be easily traced from the first period of time, and it has been less or more the subject of attention in every nation and age of the world. Though principally devoted to a pastoral life, the ancient patriarchs were not altogether ignorant of this art; and their descendants, as soon as they were settled in Palestine, considered it as being a very honourable employment: From them it was transmitted to the Chaldeans and Egyptians, to the Carthaginians and Phenicians; and it was among them in such repute, that Mago a famous general is said to have wrote twenty-eight books on the subject, which were afterwards translated into Latin by a decree of the Roman senate; and Servius observes, that these were adopted as a model by Virgil, when he wrote his *Georgica*.

It has been said, but with what truth I know not, that agriculture was introduced among the Europeans by Ceres the queen of Sicily. The first Greek writer on agriculture was Hesiod, and he

was succeeded by Democritus of Abdera, Xenophon, Aristotle, Theophrastus, and many others. This art, it is well known, was in very high reputation among the Romans*, and it was cultivated by their emperors, dictators, and consuls. The first Latin treatise on the subject of agriculture was composed by M. Cato the censor; likewise, Varro is the author of a large work on the same subject. Columella, in the reign of the emperor Claudius, wrote twelve books on husbandry; and in the reign of Constantine the fourth, a new work, as some say, collected by himself from the best writers, was published under the title of *Geoponics*, with a view of reviving this art.

In 1600, the French made several efforts to revive husbandry, and it is said several large works appeared for this purpose among them; likewise, about the same period it was industriously cultivated among the Flemings. In France, before the late revolution, there were no less than thirteen societies established by royal sanction, beside many inferior societies, for promoting agriculture. It is also publicly taught in the Danish, Swedish, and German universities. The spirit and example of Linneus and his disciples have very much conduced to the progress of this important and useful art, and the emulation of

* "When the Romans made the most illustrious appearance, husbandry was in the highest estimation amongst them. But when destructive luxury was introduced, then husbandry declined, and with it fell all the Roman virtue." *Hunter's Georgical Essays*, p. 4.

improvement

improvement has spread through most of the nations of Europe.

It is said, that among the Japanese agriculture is in great repute, and among the Chinese it is distinguished and encouraged by the court beyond all other sciences. The emperor of China yearly, at the beginning of spring, goes to plow in person, attended by all the princes and grandees of the empire. The ceremony is performed with great solemnity, and is accompanied with a sacrifice, which the emperor, as high-priest, offers to Chang-Ti, to ensure a plentiful crop in favour of his people*.

In England the first person who distinguished himself by his attention to husbandry was Fitzherbert, who published two treatises on this subject, one entitled, *The Book of Husbandry*, in 1534; and the second called, *The Book of Surveying and Improvements*, in 1739. The most considerable English writer before the Restoration was Sir Hugh Platt, who made very important discoveries with respect to the nature and qualities of manure; and since that period Evelyn, Mortimer, Bradley, and many more, have signalized themselves in the promotion of agriculture.

The general attention given to this art, both at home and abroad, and the numerous societies established for encouraging improvements in the theory and practice of it, both in Europe and America,

* If this relation be true, it ought to put us that profess Christianity to the blush, who neglect to offer the sacrifice of a contrite heart to Him who is the author and giver of every good gift.

promise a degree of perfection, of which in former ages none could have had any conception. The Royal Society, and the Society of Arts and Sciences in England, have in particular been signally useful in this respect; and the other associations which are now established in many parts of the country, co-operate with them in forwarding their laudable design. But in the spring of the year 1793, a Board of Agriculture was established, from the exertions of which, with the assistance of Parliament, the British nation has the prospect of deriving still greater advantages.

The members of this board, as I am informed, have been appointed by the king; and among the number of these honourable men, he, it is said, has nominated several bishops. In this as well as in other matters, his majesty seems to have acted with wisdom and prudence, being well persuaded that the best way of forwarding the cultivation and improvement of his extensive dominions, is to endeavour jointly and separately to enlighten and cultivate the minds and morals of the people, his subjects.—The revenue of all the inhabitants of the country is in proportion to the value of the annual produce of their land and labour; and the strength of the nation depends much, if not altogether, upon the internal resources thereof. The improvement and cultivation, therefore, of the lands should be duly encouraged; at any rate, all hindrances and discouragements ought carefully to be avoided, and judiciously laid aside.

One great hindrance to the improvement of agriculture, which presents itself to my view, is, the unimproved

improved and uncultivated state of the minds and morals of us, the people of the British empire. This, no doubt, in some degree, may justly be attributed either to the carelessness or ignorance of numbers of the clergy* of all denominations; who, it but too evidently appears, aim more at being acquainted with the opulent and great, and at ingratiating themselves into their favour, than they do at teaching and instructing the people belonging to their respective parishes and congregations: For instead of preaching the Gospel, and endeavouring to instil the doctrines of Christianity into the minds of the people, which was the sole aim and practice of the apostles, we frequently hear several of them preaching dry morality and stale politics; and when they ought to be visiting, watching, and exhorting the flocks committed by his majesty to their care, we find them visiting theatres, places of public diversion and amusement, assisting at political and philosophical associations, and publishing books † on politics, chemistry,

* Among the body of the clergy of this kingdom, there are no doubt many good men: Were it not so, it is to be feared we should soon too much imitate a neighbouring nation.

† I have read a treatise written by the Rev. R. Harris, wherein he endeavours to prove from the Scriptures, the licitness of the Slave Trade; but he has come short of his end, and no marvel; for the Scriptures hold forth no doctrines, but what tend to the happiness of mankind in general. Another treatise I have read which is written by the Rev. Dr. Knox, containing the particulars of a transaction which took place at Brighton theatre, by which he seems to have done himself but little credit, at least among serious sort of people.

and

and philosophy; and notwithstanding all the learning, all the wisdom, all the philosophy, all the philanthropy, and all the boasted religion of the British empire, it is a lamentable and an indisputable truth, that in many parts of the country, and even in the parish in which I live, several of the people grown and growing up, are ignorant and destitute of all religion, even of the very outward form of worship*.

Britain, on more than one account, may with great propriety be termed a garden, in which it is supposed there are not fewer than ten millions of people; these are well worthy of being attended to in every thing which relates to their present and future happiness.

Agreeable to the Scripture phrase, the bishops, deacons, and inferior clergy, may receive the appellations of gardeners, husbandmen, and labourers. With these the morals and good conduct of the people are particularly entrusted. Now as every one knows that all gardeners, husbandmen, and labourers, are accountable to some person for the produce, or a

* Mr. Burke, in his *Reflections on the Revolution in France*, page 135, says, "Man is by his constitution a religious animal." In this particular I cannot but dissent from the learned gentleman, because I am clearly of opinion, that man by his constitution or in his nature is an irreligious animal. Mr. Marsden, in his valuable *History of Sumatra*, says, "If by religion is meant a public or private form of worship of any kind; and if prayers, processions, meetings, offerings, images, or priests, are any of them necessary to constitute it; I can pronounce that the Rajangs are totally without religion, and cannot, with propriety, be even termed Pagans, if that, as I apprehend, convey the idea of mistaken worship; they neither worship God, devil, nor idol!"

part

part of the produce and profit of the lands which they undertake to improve and cultivate ; so in like manner must the clergy be accountable for their conduct to the great Proprietor of the aforesaid garden. Let them therefore consider, that in this extensive and most beautiful garden there is much work to do, for the ground is over-run with natural weeds, and many plants are growing up in a rude and unworkman-like state ; some want pruning, the land about others requires digging, some are broken down by the winds, and want tying up, and many require transplanting ; and as the spring is fast approaching, all hands should turn out with spirit and alacrity, and use every endeavour to get the plants in proper order, and the ground cleared of such noxious weeds as deprive them of their proper nourishment. This will undoubtedly be of great service to his Majesty : For a proof of this let us take a brief retrospective view of a neighbouring kingdom.

Before the late revolution, in the whole kingdom of France it is said there were 17 archbishops, 113 bishops, 770 abbeys for men, 317 abbeys and priories for women, besides a great number of convents, and 250 commanderies of the order of Malta. The clergy, or ecclesiastics of all sorts, were computed at nearly 200,000, and their revenues at about six millions sterling. The king nominated all archbishops, abbots, and priors, and could tax the clergy without a papal licence or mandate ; accordingly, not many years since he demanded the twentieth penny of the clergy, and to ascertain that, required them to deliver

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in an inventory of their estates and incomes ; to avoid which, they voluntarily made an offer of the annual sum of twelve millions of livres, over and above the usual free gift which they paid every five years.

Contrary both to nature and revelation, this great body of men and women had laws among themselves, prohibiting them from marriage, which by the great apostle of the gentiles is declared "honourable in all men." But notwithstanding all their pretensions to superior sanctity in this and many other absurdities, yet it is but too evident that they were in general the very pests of mankind.

Clemangis, a Doctor of Paris, in his book *De Stat. Eccl.* page 47. hath these words : "Concerning monks and abbés, what can I report that is commendable, being so petulant and undisciplined, dissolute and debauched, running up and down into common and dishonest places, and hating nothing so much as religion indeed?" And page 53 : "They are worse than the Pharisees of old, ravenous wolves in sheep's clothing, who in words pretend to forsake the world, but in deeds, with all possible fraud, deceit, lying, and cruelty, hunt after it; making an outward appearance of austerity, chastity, obedience, humility, and holy simplicity; but privately in exquisite delicacies, and varieties of epicureanism, excelling the wantonness of the most luxuriant heathens, just like Bel's priests devouring the oblations of the people; and though not with their wives, yet with their strumpets and bastards, revelling with sumptuous cheer and overflowing goblets of wine, till they pollute

pollute every thing with their insatiate lusts." This author, speaking of the nuns, gives them nearly the same character.

Before the revolution, the religious worship in France was carried on with the utmost grandeur and magnificence; it was in every respect pompous, splendid, and full of show, and better calculated to raise the veneration of the people for popish forms and ceremonies, than to make them truly religious. The people, for a number of years, had, with respect to real religion, been held in gross darkness by the ignorance, stupidity, and cunning craftiness of the self-deceived clergy; they had been oppressed and imposed upon by their great men, and loaded with taxes, through the extravagancies of the court, and by unjust and ruinous wars. They have lately been somewhat enlightened, perhaps merely through philosophical glimmerings, which have carried them to enormous lengths; their king, queen, and many of their nobility, clergy, and great men, have suffered ignominious deaths; and thousands have both fled and been driven from their native homes*, and are now obliged to live on the bounty of those, whom their abominable religion teaches to treat as the most abject heretics, doomed to eternal destruction†. All their magnificent palaces

* "The anger of the Lord hath divided them. No respect is paid to their princes or priests, the crown is fallen from their head. Woe is come upon them, because they have sinned."

† It is to be hoped that the tenets of the Roman Catholic clergy are now somewhat meliorated.

and places of worship are now desolated, their nobility, bishops, and great privileged men, are degraded and brought low; their church images and ceremonious fopperies are levelled; and, what is worst of all, their sabbaths are abolished, and the true religion is not taught in their streets. All this has come upon them, for their impious and ungodly actions.

It is undoubtedly true, that the clergy of France taught the people to honour the king and the great men; but they neglected to teach them how to fear God. If men do not fear God, the honour they may pay to the king is only forced, or done merely with a view to serve their own private ends; but men who truly and sincerely fear God, will, from a pure motive, give due honour and respect to the king, and to all men in their several stations. ●

Owing to the anarchy and confusion which lately have prevailed in France, it is said that the land in many parts of that kingdom is in an exceedingly bad state of cultivation; and my only design at present being to point out, according to my knowledge, the best way of keeping the lands in this country in a proper state of cultivation, as also some modes of improvement, I shall make only one more observation on this subject, viz. that I am clearly of opinion that the best method to make men industrious, loyal subjects, is to endeavour to make them not fawning hypocrites, but really religious observers and practisers of all the commandments of God revealed to us, and contained in that most valuable book, called the Bible.

Leaving

Leaving therefore this grand and important subject to those who are more particularly interested therein, I shall briefly point out those things which evidently appear to me to be bars, hindrances, and discouragements to the improvement of agriculture; and, as I proceed, will make some remarks and observations on the means which might be adopted for their removal.

First, Oppression and avarice in proprietors of land, are hindrances and discouragements to the improvement of agriculture; these exist in a lesser or greater degree all over the British empire, especially in that part of it called Scotland.

In a treatise concerning the Fisheries, and the Improvement of the interior Parts of the Highlands, published in the year 1791, by P. White, Esq. in page 37. it is said, “Knox says, in his View of the British Empire, vol. i. page 21. the tenants are oppressed by the proprietors of lands in the Highlands. Again, page 123 of the same volume, that the proprietors of lands in the Highlands are gamblers and horse-jockies; and page 127 of same volume, that the Highland estates are the seats of oppression, anguish, and wild despair.”

For these and such-like sayings, Mr. White strongly censures Mr. Knox, and endeavours to prove that his assertions are false; for in page 43. he says “Knox knew, as a bookseller, that scandal is always read, and that plain truth is too uniform to please the taste of an age so remarkable for the pursuit of variety;” and in page 153—155. speaking of the people of the Highlands, he says, “The common people

are sober and steady*, entire strangers to the dissolute lives which people of the same rank in the more fertile parts of the kingdom are known to lead. There is not such a set of contented † beings in the whole world (if we except the happy peasants in the vallies of Switzerland) as the small tenantry of the Highlands. Let us here, in support of our observation, bring to the recollection of some member of the Society, the satisfaction and peace he has seen within the walls of some poor Highlander, to whose house he has perhaps been driven by the stormy night. The social fire, the woman of the cottage spinning upon the rock, the spare but wholesome meal upon the fire for supper, the landlord's little live property secured from the threatening storm in the other end of the cottage, and within the view of the owner, who, to cheer his wife and little ones, beguiles the solitary hour with the recital of the achievements of some valiant ancestor in a song ‡." Here is an eloquent

* Poverty, and not goodness, either inherent or acquired, is the cause of the sobriety and steadiness of these people. The people of the Highlands of Scotland are in general less cultivated than those of the more fertile parts of the kingdom.

† Riches, instead of contentment, frequently bring misery; but can a man in pain, or having his mind impressed with a prospect of pain, either from poverty, hunger, or cold, be happy? If people are not contented when they are endowed with health, a sufficiency of food and clothing, worldly riches will not alter their state in regard to happiness. In fact, we often find the rich and opulent the most discontented beings of any; indeed we frequently hear of their making away with themselves.

‡ If this relation be true, let the Society for the Improvement of

eloquent oration by P. White, Esq. setting forth the happy lot of those poor indigent people, who live, eat, and sleep in the same room with their horses and cows, and whose substance all the year round is a scanty allowance of oat and bear meal, with sometimes a little milk, a few potatoes and plenty of water, which is as pure as the air we breathe in.

It is not at present my design or intention to exhibit the happiness or misery of any nation or people; my only drift now is, to make it appear that oppression and avarice are hindrances to agriculture. Although I cannot positively say but that Mr. Knox's account of the gentry of Scotland may be somewhat exaggerated, yet I think it will be no difficult task to convince every candid unprejudiced man, that Mr. White's relation is not altogether genuine*.

Whether

of the Highland Estates beware it do not reverse the matter by creating discontents among the people.

* Mr. White, in my opinion, is rather too severe on the present government, as well as on the British parliament. Indeed he charges them with that neglect which I conceive they are not guilty of. See pages 104. 117. 120, 121. and 186. of his work. The aim of this author, as well as others who have written on the improvement of the Highlands, seem to be more to increase rent than to promote the happiness of the tenantry. They blame government and parliament for not giving the public money for the improvement of private property. Supposing parliament were to allow a sum of money for the improvement of the Highland estates, no doubt, as soon as that improvement took place, the proprietors would raise their rents; so that they, and not the tenantry, would reap the advantage; and what the public would gain by such a mode it is difficult to determine. It is certainly in the power

Whether the people of the vallies of Switzerland are happy or not happy, is what I am altogether unacquainted with ; but that the generality of the people of the Highlands of Scotland are not very happy, may be proved even from Mr. White's own writings ; for in page 156 he says, " The Highlands at present reap not the benefit of their considerable population. There are more people there than the produce of the land can well maintain ; they are on that account obliged to wander to other places in quest of employment, and to become a kind of vagabonds upon the earth." The inconsistency of this paragraph with that which I before quoted respecting the poor people's happiness, is obvious to every intelligent reader.

Is it really possible that a people, happy at home, would betake themselves to wandering about as vagabonds in quest of employment ? Of the numbers of

of the proprietors of land to meliorate the condition of the tenantry, and to make great improvement in agriculture.

" Notwithstanding the disadvantages mentioned, were the exertions of the industrious tenant properly directed, were he instructed by those whose circumstances enable them to make useful experiments, were he freed from vexatious servitudes that are the bane of improvement, and taught to look forward with hope to the period when he should enjoy the fruit of his labour secured to him and his children by a lease for a length of years, there is little doubt but the soil could be brought to maintain double the number of its present inhabitants. The reverse of this picture is unfortunately true. The lands are only held from year to year, or on very short leases." See Sir John Sinclair's Statistical History of Scotland, vol. iii. p. 37, &c.

people

people who emigrate from Scotland, I believe but few return again. In endeavouring to make it appear that the inhabitants of these cottages are a happy people, men may hold forth, if they please, such fine oratorical language as that of Mr. White, and the nobility and gentry may believe it, but I know better; because I was born in one of them, and for the most part lived in them, till I was upwards of 16 years of age.

Secondly, Proprietors of land not living on their own estates, but trusting the management of them wholly to oppressive and severe stewards or agents, are hindrances and discouragements to agriculture.

The proprietor of the lands in the parish in which I was born, lived for the most part in London; the management therefore of his estate was entrusted to stewards or overseers. On this estate large tracts of common land were inclosed and planted; but the fences were bad, and kept in exceeding ill repair; and as it is the custom of that part of the country, after the harvest is in, for the tenants to turn their cattle out in common to graze, the fences of these plantations, as afore said, being bad, their cattle sometimes got over them amongst the trees in quest of food, and when caught there, the person to whom they belonged was fined at the discretion of the stewards; and whoever were caught, if it were but in cutting a twig of wild birch, alder, ash, &c. were likewise fined. These things, in certain cases, might be just, and needful for the preservation of the timber; but I am going to relate something which I think was far from being either just, right, or necessary.

The stewards of the estate which I have just mentioned, thinking, I suppose, that the poor tenants and farming servants had committed unknown trespasses, were determined to find it out. Accordingly they served every man come of age, and at that time living on this estate. (the minister and schoolmaster excepted), with a written summons * to appear on a given day at the school-house, there and then to take a solemn oath that they should tell the truth and nothing but the truth. Agreeable to the tenour of these mandates the men appeared with ghastly looks at the time and place appointed, and the court was opened, which, if I rightly remember, was composed of a man called the sheriff, and two of the before-mentioned stewards. The sheriff administered the oath, and the stewards were the examiners; and those who made confession of whatever was accounted trespass in either of the aforesaid matters or circumstances, were by these self-created judges (without a jury) fined according to the discretion of this court, composed of three persons. Several of the female sex were also brought into court, and underwent an examination; and as they conceived that they were to be sworn afterwards, it was said they told many things contrary to their inclinations †.

* The school-boys, I recollect, were employed in helping to write or copy these summonses.

† I was a spectator of these transactions, but being under age I was not sworn. These and many more arbitrary measures gave me a dislike, not to the country, but to the unmerciful proceedings of ungenerous men,

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If such things are allowed by the laws of Scotland, it is high time they were altered. The laws of England compel no man to become a witness against himself, nor ought they so to do; and as Scotland and England are united into one nation for the good of both, I can see no reason why the same laws ought not to pervade the whole.

Thirdly, The allowing tenants to have sub-tenants, is a hindrance to agriculture.

That this is the case needs but little penetration or discernment to discover. If I did not think so, I could relate many circumstances which would, I think, become convincing proofs of the assertion; but as I trust proprietors of lands are becoming wiser and wiser, I shall confine myself to a few.

When I left my native parish, the tenantry in it, as well as in the adjoining parishes, were extremely poor, so much so, that several of them were unable to pay their landlord his rent; and as he constantly resided in England, all that he seemed to attend to with regard to the cultivation of the soil, was to have his rent remitted him when he wanted it. Now in this parish there lived an opulent farmer, who was besides a dealer in cattle. This farmer being a good tenant in the punctual payment of his rent, he rented a great part of the land in the parish; and those portions of the land which he judged best for his own purpose he occupied himself, and the other parts he let out to tenants, most of them at will, or with but very short leases. By these means he became exceedingly oppressive, and that in many matters too numerous

numerous for me to relate. However, his tenants were by him subjected to services and inconveniences which, in my opinion, ought not, for the sake of humanity, to be suffered to exist in any part of the British dominions.

My whole design being merely to point out some of the hindrances which agriculture meets with, I shall only mention two circumstances relative to the proceedings of this opulent man. Having large farms in his own hand, he grew a great deal of barley, and turned much of it into malt, and after that into a pernicious spirit called whisky, which he sold : This, I was credibly informed, he did in violation of the then existing laws of the country. To know how to effect his purpose in this he was no novice ; for he was a jovial companion at a bottle, and knew well what would please the gauger *.

I think

* I have seen this officer groping with his stick in those parts of the farmers' houses where he had reason to think their little smuggled malt property was concealed. Relative to this affair I have been witness to scenes rather laughable. The people of a neighbourhood, living in amity, are generally acquainted with the concerns of one another ; therefore when the gauger is perceived to be in the vicinity, the alarm is given, and some one immediately sets off to inform the house where the malt is in making of the approaching danger ; others set a-running to houses where no danger is apprehended, in order to draw the enemy a wrong road : The gauger, perceiving this stir, conceives a prospect of success, and therefore rides so fast as to endanger his neck ; but notwithstanding all his vigilance, the people, by their cunning, sometimes outdo him. In such affairs I have often admired the loyalty of the people in suffering an officer to search their houses in quest of their own private property.

I think it was in the year 1771 that he let a farm to two men at a lease of eight years, and he let them have it at the same rent he paid the proprietor, on condition however, that they should pay him down, on their taking possession, by way of present or premium, just forty pounds sterling; thus the rent was raised exactly five pounds a year, not to mention the loss of the interest of the forty pounds on the one side, and the gain on the other. I being then about seventeen years of age, engaged myself for half a year with one of the occupiers of this farm, and my wages were twenty-three shillings and four-pence: I ate and drank at the same table with my master and mistress, for I was the only servant or labourer they kept. Our constant food consisted of oat-meal, bear-meal, a little milk, red cabbage, and water: This was the only subsistence we could afford to partake of, for every thing that could be mustered up must be sold to pay the landlord. The consequence of the high rent of this farm was, that the tenants had not above half strength to cultivate the ground; it was therefore done in a slovenly and very unprofitable manner, and perhaps before the eight years lease was expired the farmers might break; but this, I apprehend, would give their landlord little or no uneasiness, for if that happened,

property. To me it appears rather a hard case that a poor man should be deterred from applying a little of the produce of his own soil, which he has raised by the sweat of his brow, to the comfort and sustenance of himself and family.

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he could turn the farm into pasture * for the grazing of his cattle. Thus, through the oppression, avarice, neglect, and ignorance of individuals, is a great part of the lands of this kingdom under a bad state of cultivation.

Circumstances such as I have mentioned, seem to be too general all over Scotland: For a proof of this, I must beg leave to refer the reader to Sir John Sinclair's Statistical Account of that part of his majesty's dominions.

Fourthly, The taking tithes in kind, the want of more inclosures, the intermixture of different farmers' lands among each other; the poverty of occupiers of land; too large and too small farms; letting lands to men who have not been brought up to the business: These, and some more which I shall mention, are hindrances and discouragements to the improvement of agriculture. It is much easier to enumerate the discouragements to agriculture, than it is to find out a remedy for their removal.

Let the discouragements to agriculture be removed, and I am of opinion there will then be but little need to hold forth rewards for its improvement.

It rests wholly with proprietors of land and men of fortune, to make any very considerable advances in the improvement of agriculture. There are but few tenants capable of sinking any considerable sum

* I have frequently seen farms totally uncultivated for want of tenants: In that case, the land, being foul, sent forth in general plentiful crops of coarse natural grass, which the landlord either mowed for hay, or grazed off with cattle.

of money on improvements, even when the prospect of a profitable return is very promising; they can much better afford to pay an increase of rent equal to five per cent. for such money as the landlord may lay out upon judicious improvements, than they can to sink the principal sum in ready money. A great deal of land might be increased in value by draining: But this improvement, though obvious to every observer who in any degree is acquainted with the nature and properties of soils, is generally neglected, either because the tenant's term in the premises is not long enough to reimburse him the expense, or else for want of ready money to discharge it. The same cause also hinders the effecting of many other improvements. The landlord in such cases seems blameable; for, let the cause be what it will, it is he who has it in his power to apply the proper remedy. If he chose to lengthen the term, the tenant would generally do the work; but if he does not chuse to grant a long lease, he should at any rate pay the expense of the improvement, and take reasonable interest for his money during the remainder of the existing lease, and then he would have the benefit of its reversionary value after the expiration of the lease. If money be wanting to the landlord as well as the tenant, it perhaps might be worth his while to sell a part of his possessions to improve the rest.

Marling, claying, liming, and chalking, deserve to be liberally encouraged, and where a tenant is inclinable to set his hand to these capital objects, leases of at least twenty years should not be withheld; for
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where they are, the proprietor at present is no friend to the public, nor is he acting very judiciously for the benefit of his successors. Estates ought certainly to be let for their fair value: Whether they be under-let or over-let, the bad effects are nearly equal. In the first case the indolent tenant may be able to indulge himself in laziness, and in the second case, he as well as the industrious one is discouraged, and too much depressed; but when the true value of an estate is known, and a good tenant offers, it is unreasonable to expect him to risk his property without putting him upon a footing of some certainty. And therefore land-owners who refuse leases in such cases, merely because they will keep their tenants in a state of submission and dependance, are not acting prudently, because by such conduct they prefer present gratification to their real future interest, and to the more enlarged notions of contributing all they can to the advantage and prosperity of their country.

Every large estate will undoubtedly admit of improvements in many points, and of which the proprietor may avail himself by the proper application of a little ready money.

The rent of land not only varies with its fertility, whatever be its produce, but also with its situation, whatever be its fertility. Land in the neighbourhood of a town gives a greater rent than land equally fertile in a distant part of the country. For though it may cost no more labour to cultivate the one than the other, yet it must always cost more to bring the produce of the distant land to market.

Good

Good roads, canals, and navigable rivers, by diminishing the expense of labour, put the remote parts of the country more nearly upon a level with those in the neighbourhood of the town. They are upon that account very great improvements, for they always encourage the cultivation of the remote parts, which is the most extensive circle of the country; they are of advantage to the town, by breaking down the monopoly of the country in its neighbourhood; though they introduce some rival commodities into the old market, they open many markets to its produce.

Monopoly is an enemy to good management, which can never be universally established but in consequence of that free competition which forces every person to have recourse to it for self-defence. It is said, that it is not much above half a century since some of the counties in the neighbourhood of London petitioned the parliament against the extension of the turnpike roads into the remoter counties. They pretended that those remoter counties, from the cheapness of labour, would be able to sell their hay and corn cheaper in the London market than themselves, and would thereby reduce their rents, and ruin their cultivation. Their rents, however, have risen, and their cultivation has been greatly improved, since that time.

A corn-field of moderate fertility produces a greater quantity of food for man than the best pasture of equal extent; and though its cultivation requires more labour, yet the surplus which remains after replacing the seed, and maintaining all the labour, is likewise greater.

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The food of man seems to be the only produce of land which always, and necessarily, affords some rent to the landlord; other sorts of produce sometimes may, and sometimes may not, according to different circumstances. Countries are populous not in proportion to the number of people whom their produce can clothe and lodge, but in proportion to that of those whom it can feed.

It would seem that food is not only the original source of rent, but every other part of the produce of land which afterwards affords rent, derives that part of its value from the improvement of the powers of labour in producing food by means of the improvement and cultivation of land. The increasing abundance of food in consequence of increasing improvement and cultivation, must of course increase the demand for every part of the produce of land which is not food, but which can be applied either to use or ornament.

In consequence of the extension of agriculture, the land of every country produces a much greater quantity of vegetable than of animal food, and the labourer every-where lives chiefly upon the wholesome food that is cheapest and most abundant. Butcher's meat, except in the most thriving countries, or where labour is most highly rewarded, makes but an insignificant part of the labourer's subsistence. In Scotland the labouring poor seldom eat butcher's meat, except upon holidays and other extraordinary occasions.

Rent, considered as the price paid for the use of land, is naturally the highest which the tenant can afford

afford to pay in the actual circumstances of the land. In adjusting the terms of the lease, the landlord endeavours to leave the tenant no greater share of the produce than what is sufficient to keep up the stock, from which he furnishes the seed, pays the labour, and purchases and maintains the cattle, and other instruments of husbandry, together with the ordinary profits of farming stock in the neighbourhood. This is evidently the smallest share with which the tenant can content himself; and the landlord seldom means to leave him any more: Whatever part of the produce, or, what is the same thing, whatever part of its price, is over and above this share, he naturally endeavours to reserve to himself as the rent of his land, which is clearly the highest the tenant can afford to pay in the actual circumstances of the land. Sometimes indeed the liberality, more frequently the ignorance, of the landlord makes him accept of somewhat less than his portion, and sometimes too, though more rarely the ignorance of the tenant, makes him undertake to pay somewhat more, or to content himself with somewhat less, than the ordinary profits of farming stock in the neighbourhood. This portion, however, may still be considered as the natural rent of land, or the rent for which it is naturally meant that land should be for the most part let. It may be thought that the rent of land is frequently no more than a reasonable profit or interest for the money laid out by the landlord upon its improvement: This, no doubt, may be partly the case upon some occasions, for it can scarce ever be more than partly

the case. The landlord even demands a rent for unimproved land, and the supposed interest or profit upon the expense of improvement is generally an addition to this original rent. Those improvements are not always made by the stock or money of the landlord, but sometimes by that of the tenant. However, when the lease comes to be renewed, the landlord commonly demands the same augmentation of rent, as if they had all been made at his own cost.

He sometimes demands rent for what is altogether incapable of human improvement. Kelp is a species of sea-weed which, when burnt, yields an alkaline salt, useful for making glass, soap, and for several other purposes. It grows in several parts of Great Britain, particularly in Scotland, upon such rocks only as lie within high-water mark, which are twice every year covered with the sea, and of which the produce therefore was never augmented by human industry. However, the landlord, whose estate is bounded by a kelp-shore of this kind, demands a rent for it as much as for his corn-fields.

The sea in the neighbourhood of the islands of Shetland is more than commonly abundant in fish, which makes a great part of the subsistence of their inhabitants; but in order to profit by the use of the water, they must have a habitation upon the neighbouring land. The rent of the landlord is in proportion, not to what the farmer can make by the land, but to what he can make both by the land and water. It is partly paid in sea-fish; and one of the very few instances in which rent makes a part of

the price of that commodity is to be found in that country.

The rent of land therefore, considered as the price paid for the use of the land, is naturally a monopoly price. It is not at all proportioned to what the landlord may have laid out upon the improvement of the land, or to what he can afford to take, but to what the farmer can afford to give.

Every improvement in the circumstances of the society tends, either directly or indirectly, to raise the real rent of land, to increase the real wealth of the landlord, his power of purchasing the labour, or the produce of the labour of other people. The extension of improvement and cultivation tends to raise it directly; the landlord's share of the produce necessarily increases with the increase of the produce.

That rise in the real price of those parts of the rude produce of land, which is first the effect of extended improvement and cultivation, and afterwards the cause of their being further extended, the rise in the price of cattle, for example, tends too to raise the rent of land directly, and in a still greater proportion. The real value of the landlord's share, his real command of the labour of other people, not only raises the real value of the produce, but the proportion of his share to the whole produce rises with it. That produce, after the rise in its real price, requires no more labour to collect it than before. A smaller proportion of it therefore will be sufficient to replace, with the ordinary profit, the money which

employs that labour: A greater proportion of it must consequently belong to the landlord.

All those improvements in the productive powers of labour, which tend directly to reduce the real price of manufactures, seem to tend directly to raise the real rent of land.

The landlord exchanges that part of his rude produce which is over and above his own consumption, or, what comes to the same thing, the price of that part of it, for manufactured produce. Whatever reduces the real price of the latter raises that of the former; an equal quantity of the former becomes thereby equivalent to a greater quantity of the latter, and the landlord is enabled to purchase a greater quantity of the conveniences, or ornaments, or luxuries, which he has occasion for.

Every increase in the real wealth of the society, and every increase in the quantity of useful labour employed within it, tends directly to raise the real rent of land. A certain proportion of this labour naturally goes to the land, a greater number of men and cattle are employed in its cultivation, the produce increases with the increase of the stock or money which is thus employed in raising it, and the rent increases with the produce.

The contrary circumstances, that is, the neglect of cultivation and improvement, the fall in the real price of any part of the rude produce of land, the rise in the real price of manufactures from the decay of manufacturing art and industry, the declension of
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the real wealth of the society, all tend, on the other hand, to lower the real rent of land, to reduce the real wealth of the landlord, to diminish his power of purchasing either the labour, or the produce of the labour, of other people.

The whole annual produce of the land and labour of every country, or, what comes to the same thing, the whole price of that annual produce, naturally divides itself into three parts : First, the rent of land ; second, the wages of labour ; and, third, the profits of money or stock. These constitute a revenue to three different orders of people : First, to those who live by rent ; second, to those who live by wages ; and, third, to those who live by profit. These are the three great original and constituent orders of every civilized society, from whose revenue that of every other order is ultimately derived.

The interest of the first of those three great orders it appears, from what I have already said, is strictly and inseparably connected with the general interest of the society : Whatever either promotes or obstructs the one, necessarily promotes or obstructs the other. When the public deliberates concerning any regulation of commerce or police, the proprietors of land can seldom mislead it with a view to promote the interest of their own particular order, at least if they have any tolerable knowledge of that interest. Some of them are indeed too often defective in this tolerable knowledge ; they are the only one of the three orders whose revenue costs them nei-

ther labour nor care, but comes to them as it were of its own accord, and frequently independent of any plan or project of their own. That indolence, which is the natural effect of the ease and security of their situation, renders some of them not only ignorant, but incapable, of that application of mind which is necessary in order to foresee and understand the consequences of any public regulation.

The interest of the second order, that of those who live by wages, is as strictly connected with the interest of the society as that of the first. The wages of the labourer are never so high as when the demand for labour is continually rising, or when the quantity employed is every year increasing considerably. When this real wealth of the society becomes stationary, his wages are soon reduced to what is barely enough to enable him to bring up a family, or to continue the race of labourers. The order of the proprietors may perhaps gain more by the prosperity than that of labourers; but there is no order that suffers so cruelly from its decline. But though the interest of the labourer is strictly connected with that of the society, he is incapable either of comprehending that interest, or of understanding its connection with his own; his condition leaves him no time to receive the necessary information, and his education and habits are commonly such as to render him unfit to judge, even though he was fully informed. Therefore in the public deliberations his voice is little heard, and less regarded, except upon some particular

particular occasions, when his clamour is animated, set on, and supported by his employers, not for his, but for their own particular purposes.

The employers of the labourer constitute the third order, that of those who live by profit: It is the stock or money that is employed for the sake of profit, which puts into motion the greater part of the useful labour of every society. The plans and projects of employers of money or stock, regulate and direct all the most important operations of labour, and profit is the end proposed by all those plans and projects; but the rate of profit does not, like rent and wages, rise with the prosperity, and fall with the declension, of the society—on the contrary, it is naturally low in rich, and high in poor, countries, and it is generally highest in the countries which are going fastest to ruin. The interest, therefore, of this third order has not the same connexion with the general interest of the society as that of the other two. Merchants and master-manufacturers are, in this order, the two classes of people who commonly employ the largest capitals, and who by their wealth draw to themselves the greatest share of the public consideration; as, during their whole lives, they are engaged in plans and projects, they have frequently more acuteness of understanding than the greater part of country gentlemen. As their thoughts are however commonly exercised rather about the interest of their own particular branch of business, than about that of the society, their judgment, when given with candour,

dour, is much more to be depended on with regard to the former of these two objects, than with regard to the latter. Their superiority over the country gentleman is not so much in their knowledge of the public interest, as in their having a better knowledge of their own interest than he has of his. It is by this superior knowledge of their own interest that they have frequently imposed upon his generosity, and persuaded him to give up both his own interest and that of the public.

The interest of the dealers in any particular branch of trade or manufactures, is continually in some respects different from, and even opposite to, that of the public. To widen the market, and to narrow the competition, is always the interest of the dealers. To widen the market may frequently be agreeable enough to the interest of the public; but to narrow the competition, must always be against it, and can serve only to enable the dealers by raising the profits above what they naturally would be, to levy for their own benefit an absurd tax upon the rest of their fellow-citizens.

The proposal of any new law, or regulation of commerce, which comes from this order, ought to be listened to with great precaution; and should never be adopted till after having been long and carefully examined, and that with the most scrupulous and suspicious attention: For it comes from an order of men whose interest is never exactly the same with that of the public, who have generally an interest to
deceive,

deceive, and even to oppress, the public; and who, accordingly, have, it is said, upon many occasions, both deceived and oppressed it.

The inhabitants of a town, being collected into one place, can very easily combine together. The most insignificant trades carried on in towns, have accordingly, in some place or other, been incorporated, and even where they have never been incorporated, yet, the corporation spirit, the jealousy of strangers, the aversion to take apprentices, or to communicate the secret of their trade, generally prevail in them, and often teach them, by voluntary associations and agreements, to prevent that free competition which they cannot prohibit by bye-laws.

The trades which employ but a small number of hands run most easily into such combinations. By combining not to take apprentices, they can not only engross the employment, but reduce the whole manufacture into a sort of slavery to themselves, and raise the price of their labour much above what, perhaps, is due to the nature of their work.

The inhabitants of the country, being dispersed in distant places, cannot easily combine together; they have not only never been incorporated, but the corporation spirit never, that I have heard of, has prevailed among them. No apprenticeship has ever been thought necessary to qualify for husbandry.

After what are called the fine arts, and the liberal professions, however, there is perhaps no trade or occupation which requires so great a variety of knowledge and experience as agriculture and garden-

ing *. The many volumes which have been written upon agriculture may satisfy us that, among the wisest and most learned nations, it has never been regarded as a matter very easily understood ; and from all those volumes we shall in vain attempt to collect that knowledge of its various and complicated operations which is commonly possessed even by the common farmer and gardener, how contemptuously soever the very contemptible authors of some volumes may sometimes affect to speak of them †.

There is scarce any common mechanic trade, on the contrary, of which all the operations may not be as completely and distinctly explained in a pamphlet of a very few pages, as it is possible for words, illustrated by figures, to explain them.

The direction of operations, which must be varied with every change of weather, as well as with many other accidents, requires much more judgment and discretion than that of those which is always the same, or very nearly the same.

Not only the art of the general direction of the operations of husbandry and gardening, but many inferior branches of country labour, require much more skill and experience than the greater part of mechanic trades. The man who works upon brass and iron, works with instruments and upon materials

* Gardening is only considered as being a branch of agriculture.

† “ How can he,” says Mr. Burke, “ get wisdom that holdeth the plow, and that glorieth in the goad; that driveth oxen, and is occupied in their labours, and whose talk is of bullocks ?”

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of which the temper is always the same; but the man who plows the ground with a team of horses, or oxen, works with instruments of which the health, strength, and temper, are very different upon different occasions. The condition of the materials which he works upon, too, is as variable as that of the instruments which he works with; and both require to be managed with judgment and discretion.

The common plowman, though generally regarded as the pattern of stupidity and ignorance, is seldom defective in his judgment and discretion; he is indeed less accustomed to social intercourse than the mechanic who lives in a town; his voice and language are more uncouth, and more difficult to be understood by those who are not used to them.

His understanding, however, being accustomed to consider a great variety of objects, is generally much superior to that of the other, whose whole attention, from morning till night, is commonly occupied in performing one or two very simple operations.

How much the lower ranks of people in the country are really superior to those of the town, is well known to every man, whom either business or curiosity has led to converse much with both.

It is said, that in China and Indostan, both the rank and wages of country labourers are superior to those of the greater part of artificers and manufacturers; they would probably be so every-where, if corporation laws, and the corporation spirit, did not prevent.

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The consideration of his own private profit is the sole motive which determines the owner of any capital to employ it, either in agriculture, in manufactures, or in some particular branch of the wholesale or retail trade. The different quantities of productive labour which it may put into motion, and the different values which it may add to the annual produce of the land and labour of the society, according as it is employed in one or other of those different ways, seldom enter into his thoughts. Therefore, in countries where agriculture is the most profitable of all employments, and farming and improvement the most direct roads to a splendid fortune, the capitals of individuals will naturally be employed in the manner most advantageous to the whole society.

The profits, however, of agriculture, seem to have no superiority over those of other employments, at least in any part of Britain. Projectors, indeed, in several parts of it, have, within these few years, amused the public with magnificent accounts of the profits to be made by the cultivation and improvement of land.

The cultivation and improvement, however, of land, undoubtedly tends more to the benefit and advantage of the whole nation than it does to the acquirement of a splendid fortune to any one individual. Without entering into any particular discussion of these things, one or two simple observations may serve to satisfy us on this subject.

We often see and hear of the most splendid fortunes, that have been acquired in the course of a few years,

years, or of a single life, by trade and manufactures, even frequently from a very small capital ; but a single instance of such a fortune, acquired by agriculture, in the same time, and from such a capital, has not perhaps occurred during the course of the present century. In Britain, much good land still remains uncultivated ; and a great part of what is cultivated is far from being improved to the degree of which it is capable.

Agriculture is almost every-where capable of absorbing a much greater capital than has ever yet been employed in it.

Circumstances in the policy of Britain, as well as in every part of Europe, have given the trades which are carried on in towns so great an advantage over that which is carried on in the country, that private persons frequently find it more for their advantage to employ their capitals in the most distant carrying trades of Asia and America, than in the improvement and cultivation of the most fertile fields in their own neighbourhood.

The farmer, compared with the proprietor, is as a merchant who trades with borrowed money, compared with one who trades with his own. The stock of both may improve ; but that of the one, with only equal good conduct, must always improve more slowly than that of the other, on account of the large share of the profits which is consumed by the interest of the loan. The lands cultivated by the farmer must, in the same manner, with only equal
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good conduct, be improved more slowly than those cultivated by the proprietor, on account of the large share of the produce which is consumed in the rent, and which, had the farmer been proprietor, he might have employed in the further improvement of the land.

The station of a farmer is, from the nature of things, inferior to that of a proprietor.

Through the greater part of Britain, the yeomanry are regarded as an inferior rank of people, even to the better sort of tradesmen and mechanics; and in all parts to the greater merchants and master-manufacturers. Therefore, it can seldom happen that a man, possessed of any considerable stock of money, should quit the superior, in order to place himself in the inferior station. In the present state, therefore, of this country, as well as that of all Europe, little money comparatively, is likely to go from any other profession to the improvement of land in the way of farming. More does in Great Britain than in any other country, though even there, the sums which are in some places employed in farming, have generally been acquired by farming; the trade, perhaps, in which of all others money is commonly acquired most slowly.

Small proprietors are in general the greatest improvers; and next to them are rich farmers. There are more such, it is supposed, in England, than in any European monarchy. In the governments of Holland, and of Berne in Switzerland, the farmers
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are said to be not inferior to those of England. It seems to happen but seldom, that a great proprietor is a great improver.

The great commerce of every civilized society is that carried on between the inhabitants of the town and those of the country. It consists in the exchange of rude manufactured produce, either immediately, or by the intervention of money, or of some sort of paper which represents money. The country supplies the town with the means of subsistence and the materials of manufacture. The town repays this supply by sending back a part of the manufactured produce to the inhabitants of the country. The town in which there neither is, nor can be, any reproduction of substances, may very properly be said to gain its whole wealth and subsistence from the country. It should not, however, on this account, be imagined that the gain of the town is the loss of the country; for the gains of both are mutual and reciprocal, and the division of labour is in this, as in all other cases, advantageous to all the different persons employed in the various occupations into which it is divided.

The inhabitants of the country purchase of the inhabitants of the town a greater quantity of manufactured goods with the produce of a much smaller quantity of their own labour than they must have employed had they attempted to prepare them themselves.

Subsistence being, in the nature of things, prior to conveniency and luxury, so the industry which

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produces the former must necessarily be prior to that which ministers to the latter ; therefore, the cultivation and improvement of the country, which affords subsistence, must necessarily be prior to the increase of the town, which furnishes only the means of conveniency and luxury. It is the surplus produce of the country, only, or what is over and above the maintenance of the cultivators, that constitutes the subsistence of the town, which, on that account, can increase only with the increase of this surplus produce. Indeed, the town may not at all times derive its whole subsistence from the country in its neighbourhood, or even from the territory to which it belongs, but from very distant countries ; and this, though it forms no exception from the general rule, has occasioned considerable variations in the progress of opulence in different ages and nations. That order of things which necessity imposes in general, though not in every particular country, is, in every particular country, promoted by the natural inclinations of man. Had human institutions never thwarted those natural inclinations, the town could have nowhere increased beyond what the improvement and cultivation of the territory in which they were situated could support, till such time, at least, as the whole of that territory was completely cultivated and improved.

Upon equal, or nearly equal profits, most men will chuse to employ their capitals rather in the improvement and cultivation of land than either manufactures or foreign trade.

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The man who employs his money in land has it more under his view and command, and his fortune is much less liable to accidents than that of the trader, who is obliged frequently to commit it, not only to the winds and the waves, but to the uncertain elements of human folly and injustice; by giving great credits in distant countries to men whose character and situation he can be seldom thoroughly acquainted.

The capital of the landlord, on the contrary, which is fixed in the improvement of his land, seems to be as well secured as the nature of human affairs can admit of; and besides this, the beauty of the country, the pleasures of a country life, the tranquillity of mind which it promises, have charms which, more or less, attract every person; and as the business of cultivating the ground was the first employment of man, so, in every stage of his existence, he seems to retain an inclination for this primitive occupation.

The money that is acquired to any country by commerce and manufactures, is a very precarious and uncertain possession, till some part of it has been secured and realized in the cultivation of its lands. A merchant, it has been said, is not necessarily the citizen of any particular country; it is in some measure indifferent to him from what place he carries on his trade, and a trifling disgust will make him remove his money, and, together with it, all the industry which it supports, from one country to another; no part of it can be said to belong to any particular

ticular country till it has been spread, as it were, over the face of that country, either in buildings, or in the lasting improvements of land.

The revolutions of war and government easily dry up the sources of that wealth which arises from commerce only. But that which arises from the more solid improvements of agriculture is much more durable, and less liable to be affected.

Some landlords, instead of raising the rent, take a fine for the renewal of the lease. This practice is in most cases the expedient of a spendthrift, who, for a sum of ready money, sells a future revenue of much greater value. It is in most cases hurtful to the landlord; it is frequently hurtful to the tenant; and it is always hurtful to the community. It frequently takes from the tenant so great a part of his money, and thereby diminishes so much his ability to cultivate the land, that he finds it more difficult to pay a small rent than it would otherwise have been to pay a great one. Whatever diminishes his ability to cultivate, necessarily keeps down below what it otherwise would have been, the most important part of the revenue of the community.

There are some leases which prescribe to the tenant a certain mode of cultivation, and a certain succession of crops during the whole continuance of the lease. This condition, which is generally the effect of the landlord's conceit of his own superior knowledge, a conceit, perhaps, not well founded, ought always to be considered

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as an additional rent, as, a rent in service instead of a rent in money. In some parts of Great Britain where I have lived, the landlords, instead of taking the whole rent in money, require a part of it in kind, in corn, poultry, &c. : Others, again, require a rent in service. Such are always more hurtful to the tenant than beneficial to the landlord. They either take more, or keep more out of the pocket of the former than they put into that of the latter. In every part of the country, where they take place, the tenants are poor and beggarly, pretty much according to the degree in which they take place. The landlord who cultivates a part of his own land, being generally richer than the tenant, can with less skill frequently raise a greater produce. He can afford to try experiments, and is often disposed to do so; his unsuccessful experiments occasion only a moderate loss to himself; his successful ones contribute to the improvement and better cultivation of the whole country.

Some, who have made observations upon the wealth of this country, have considered the extensive forests, chases, and commons, as one of the greatest resources remaining to the nation; and have lamented that such large tracts of improvable land should be suffered to lie in a neglected and uncultivated state. Many other waste lands in Great Britain, which seem to be at the disposal of individuals, are capable of being improved and cultivated. Many parishes in England possess a right of common upon many acres. These commons are by some said to be of

great use to the poor ; but, unless it be in the article of fuel, it appears to me that they are not. That class immediately above the poor, or a stage above poverty, seem to be most benefited by them.

The advocates for commons say that they are of great use to the poor, and that a greater number of people are supported by them than if they were cultivated, and that a vast number of young cattle are bred upon them. Such observations are generally made by humane well-meaning people.

Before commons are made inclosures, their utility ought to be well weighed and duly considered by men of knowledge, who have no interest in them, but who appear to have the good of the whole community in view.

- Perhaps there is not one cottager out of ten upon an average that keeps even a cow ; and cottagers being generally tenants and very seldom owners, they rent these, frequently miserable habitations, proportionably high on the account of their situation. It is the proprietor, therefore, and not the occupier, of these cottages* who, in fact, gets what advantage there is to be had. The cottagers themselves appear not to be, in any shape, more comfortable than those who live in parishes where there are no

* In the neighbourhood in which I live several cottages have lately been fold, and I have observed that the purchasers are in general tradesmen who live in adjacent towns. These purchases seem to be made merely with a view to get more, or at least as much interest for the money laid out as the purchasers could thereby gain in the way of trade ; this, no doubt, induces them to extort the highest rent from the poor cottager.

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commons; because if there is any advantage to be derived from their situation, they do not enjoy it without paying for it. Land being of no value without people to cultivate it, the labourer is one of the most valuable members of society; without him the richest soil is not worth owning. His situation then should be considered and made at least comfortable, if it were merely out of good policy. No object is certainly so highly deserving of the country gentleman's attention: His interest and his duty ought equally to induce him to do all he can to place the labourer on a better footing than he generally is at present.

One object which deserves consideration, is the state of the cottages which the useful class of labourers inhabit, and how far their condition can be improved by better regulation. The shattered hovels which half the poor of this kingdom are obliged to put up with, is truly affecting to a man endowed with humanity; those who visit and are perfectly acquainted with these miserable habitations can testify, that neither health or decency can be preserved in them. For the weather frequently penetrates all parts of them, which must occasion illness of various kinds, particularly agues and rheumatisms; the former more frequently visit the children of cottagers than others, and shake their constitutions; the latter visit those grown in age, and disable them from earning a decent subsistence. It is a matter of lamentation, that a man, his wife, and five or six children, should be obliged to lie all in one room to-

gether, and still more so that the wife should have no more private place to be brought to bed in. Offensive as this description may appear to some, it is not exaggerated.

We see gentlemen exceedingly careful of their horses, and even of their dogs, which are less useful animals; we see them bestow considerable attention upon their stables and kennels; but too many are apt to look upon cottages as incumbrances and clogs to property, when, in fact, those who occupy them are the very nerves and sinews of agriculture. Perhaps more real advantages flow from cottagers than from any other source; for, not to mention their great utility to landed property, they are the greatest support to the state, as being the most prolific class for population*.

Cottagers, undoubtedly, are a most beneficial race of people; they are bred up in greater simplicity, live more retired lives, and seem more free from vice and debauchery than any other set of men in the lower

* Agriculture, the first and most healthful of all employments, is now, it seems, followed by few who are able to carry on any other business. Those who imagine that the produce of Britain is not sufficient to maintain all its inhabitants, I think, are mistaken. Agriculture is the great source of domestic riches; whatever wealth may be imported from abroad, if the cultivation of the soil is neglected, poverty and misery will abound at home. For such is, and ever will be, the fluctuating state of trade and manufactures, that thousands of people may be in full employment this year, and in beggary the next. This is not so likely to happen to those who cultivate the ground; they can eat the fruit of their labour, and can almost always, by industry, obtain at least the necessities of life.

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class, and are best formed and enabled to sustain the hardships of war and other laborious services. Large populous cities and towns are destructive both to morals and health; for where many of the lower sort of people crowd together, they corrupt the morals of each other, and are obliged to put up with bad accommodation, and an unwholesome confined air, which breeds distempers, debilitates their bodies, and shortens their lives. It is therefore apparent, that all great cities and towns must cause a diminution or waste of people; therefore the country must be the place, and cottages and small farms the chief nurseries which support population.

It would, without doubt, contribute to the advantage of the proprietors of land, as well as of the public at large, to build a sufficient number of cottages on their estates. There would be no occasion to build extensive ones; all that is required is a comfortable plain warm room to cook and eat their victuals in, and a small apartment for provisions, and two wholesome lodging apartments, one for the man and his wife, and another for his children. A handsome cottage of this description could be built for about sixty pounds, and in some parts of the country for less, and every cottage should have a piece of ground allowed for a garden*, and the landlord might be contented with four per cent. for his money thus laid out.

* It might also be proper to let the cottager have land sufficient to maintain a cow.

Cottagers

Cottagers should never be under the control of the farmer or tenant, but should hold their lease under the landlord. This would be dealing with the poor as gentlemen would wish to be dealt with in a similar situation; but instead of this, cottagers are chiefly left by gentlemen to the farmers' disposal, and when they are accommodated with a small quantity of land, are obliged to pay at least a double portion of rent for it to what the farmers pay themselves.

In almost every parish there is some particular gentleman who has sufficient authority and influence over it to correct the present grievance, and to set a better example. It would be well if such gentlemen would consider themselves as guardians of the poor, and attend to their accommodation and happiness: Indeed it is what they should make their particular business; because they and their families have a lasting interest in the prosperity of the parish.

If a gentleman's fortune be so large that he cannot attend to objects of this sort, he should at least recommend the poor cottagers to the attention of his agent, and give him strict orders to act as their friend and protector; for unless some such check be put upon some avaricious great farmers, they are very apt to contribute to the demolition, instead of the protection, of cottages; and when the nest is destroyed, every body knows that the bird must emigrate.

Often in this case a cottager has no other choice, unless it be to make application to the neighbouring justice of the peace for his order to the parish officers

officers to find him some other place to dwell in. Were it not for this excellent law, which obliges parish-officers to find habitations for the poor, it is even to be feared that in many parishes they would be actually driven into the open fields.

It is said that in the Austrian Netherlands there are no large farms, nor no class of men who pass under the character of gentlemen-farmers, acquiring large fortunes merely by superintending the business of farming; but that the whole country is divided into much smaller portions than the land is with us, and occupied by a set of laborious people who, in general, work for themselves. The population of this country is said to be great, and the markets plentiful beyond description. This would seem to be a presumptive proof that agriculture, when it is thrown into a number of hands, becomes the life of industry, the source of plenty, and the fountain of riches to a country; but that, when monopolized and grasped into few hands, it must dishearten the bulk of mankind, who are reduced to labour for others instead of themselves, and must lessen the produce, and tend to general poverty.

In a kitchen garden, in a fruit garden, and in a hop garden, both the rent of the proprietor, and profit of the tenant, are generally greater than in a grass or corn field; but to bring the ground into this condition requires more expense; therefore a greater rent becomes due to the landlord. Likewise it requires a more skilful and attentive management; so that a greater profit becomes due to the cultivator;

tor; also the crop, at least in the fruit and hop garden, is more precarious, on which account its price must afford something like the profit of insurance.

The gardener who, with his own hands, cultivates his own garden, unites, in his own person, the three different characters of landlord, farmer, and labourer. Therefore his produce should pay him the rent of the first, the profit of the second, and the wages of the third: Generally, however, the whole is considered as the earnings of his labour. In this case both rent and profit are confounded with wages,

Gardeners in their circumstances being generally mean, and always moderate, may convince every person that their great ingenuity is commonly not very well recompensed. Their delightful art is practised by so many people of great fortunes for amusement, that but little advantage can be made by those that practise it for profit; because the persons who naturally should be their best customers, supply themselves with all their most precious productions.

It would, no doubt, be presumption in me to attempt wholly to account for the amazing increased price of provisions with us. Indeed there are many causes which contribute to it; but it is very evident that no single cause affects it so much as the practice which has prevailed for some time back of demolishing small farms: This custom, which is not without plenty of advocates, has perhaps been begotten by covetousness, and brought forth by ill-digested calculations; for it seems to be attended with oppression to
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individuals, and ends in considerable private loss and public calamity.

The landlord, tenant, and labourer, are intimately connected together, and have their reciprocal interest, though in different proportions; and when the just equilibrium between them is interrupted, the one or the other must receive injury. At present, in many parts of the country, the balance seems to be against the two latter; and yet, though to some it may seem paradoxical, the other party ultimately receives no real advantage from it.

The increase of the poor and poor-rates I think may be easily accounted for. The rise upon land and its produce is greater than the rise upon labour; the difference is therefore against the working hands; and when their earnings are insufficient for the absolute necessities of life, they must fall upon the parish, which is bound, in that case, to make up the deficiency; so that if this matter be duly considered, a want of policy may be discovered in beating down the value of labour. It is undoubtedly much better for a farmer to give an industrious man who has a large family a shilling or two more a week than to load a farm with that additional incumbrance in the rates; because when once a poor man is obliged to have recourse to the parish, he thinks no greater disgrace to be beholden to it for a guinea than for a shilling; and, therefore, when he cannot wholly support his family by labour, perhaps he will not care how small a portion he contributes towards it.

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Great complaints have been made on account of the rapid increase of the poor-rates. The grand cause of this seems to be, that the price of labour has not advanced in proportion to the advance in the price of provisions. If the price of labour could be made to rise in proportion to the rise of provisions, in my opinion it would greatly lessen the poor-rates, and meliorate the condition of the poor, which would be of infinite advantage to the community at large. Some, indeed have maintained that high wages encourage idleness, and occasion drinking and profligacy, for that the workmen who are best paid are the poorest, and their families soonest become burdensome to the parishes.

There are, undoubtedly, some individuals who would spend all their earnings were they ever so great, and the more they could earn in a short time, the more profligate, drunken, and worthless, they would become. Perhaps there are bodies of manufacturers, who, working together in one place, the higher their wages, the stronger would be their temptation to drinking, the sooner would they sink into the habits of sottishness, and themselves be the sooner clothed with poverty and rags : But even this is not always the case ; for in some of the most considerable manufacturing towns, where the wages of the workmen are very considerable, the poor are in a very comfortable condition. But supposing the force of this objection be allowed in particular situations, I do not think it is applicable to the great bulk of the poor, taken promiscuously in town and country. In this general collective view, the allurements and temptations

tions to irregular conduct, and to social intemperate drinking, are not so immediate and powerful.

The poor have the same understanding, the same acuteness of penetration, and they use, as far as their ideas extend, the same consequential reasoning, as their superiors. If then they are capable, by assiduous application, of earning something more than is sufficient to their immediate necessities, will they work only three or four days in the week, and spend the rest in idleness, drunkenness, and debauchery? Whatever some may say of them, they are not without the sensibility of the comforts and conveniences of life. The hopes of bettering their own circumstances will be a continual spur for making provision for a future period of life, for sickness and disease, for the comfort of old age and infirmity, or for the assistance of a rising family.

It is said that in North America, before its separation from this kingdom, country labour received double the wages given in Britain, and yet this did not make the labourers lazy and profligate; for it is affirmed by men of veracity that quite the contrary took place. It was the sharpest spur to industry, it greatly prevented every temptation to unlawful intercourse between the sexes, it gave incitement to early marriages, early marriages took place, a numerous offspring followed, and every additional child was accounted additional wealth. The labourer, with a large family of young children around him, instead of sinking into despondency, or being overwhelmed with immediate distress or poverty, was considered as possessed of a fortune.

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Whatever pernicious influence high wages may have on the minds of some individuals, or sects of individuals, yet I am of opinion, that to the bulk of poor men they are the most powerful incitements to diligence and regular industry, inasmuch as they open to them the pleasing prospect of a decent competence, and final repose from toil, labour, and fatigue. Poverty, though it, no doubt, discourages, does not always prevent, marriage. Though the marriages of poor people are generally more fruitful than those of people of fashion, yet it is reckoned that a smaller proportion of their children arrive at maturity. In foundling hospitals, and among the children brought up by parish charities, the mortality is still greater than among those of the common people.

Every species of animals multiplies in proportion to the means of their subsistence, and no species can ever multiply beyond it; but in civilized society it is only among the inferior ranks of people that the scantiness of subsistence can set limits to the further multiplication of the human species; and it seems it can do it in no other way than by destroying a great part of the children which their fruitful marriages produce. The liberal reward of labour, by enabling them to provide better for their children, and consequently to bring up a greater number, naturally tends to widen and extend those limits.

The liberal reward of labour, as it is the effect of increasing wealth, so it is the cause of increasing population: To complain of it, therefore, is to lament over the necessary effect and cause of the greatest prosperity.

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The liberal reward of labour, as it encourages the propagation, so it increases the industry, of the common people. The wages of labour are the encouragement of industry, which, like every other human quality, improves in proportion to the encouragement it receives. A plentiful share of subsistence increases the bodily strength of the labourer; and the comfortable hope of bettering his condition, and of ending his days, perhaps, in ease and plenty, animates him to exert that strength to the utmost. Accordingly where wages are high, workmen will always be more active, diligent, and expeditious, than where they are low.

The charities and bounties bestowed in England are beyond description. The generosity of the English has been eminently distinguished in the late subscriptions to the maintenance of the French emigrant clergy, and to the support of the distressed families of Spital-fields. It would, perhaps, in some cases be well if such large sums of money were laid out in procuring employment for those who are able to work; for it certainly tends to the hurt of the community to have individuals, or any set of individuals, living in it in idleness. In my opinion it is doing more real good to set people to work who are able, and in want, than it is to bestow charity or alms on them. A judicious writer says, "The humanity of the English is discovered in nothing more than in the subscriptions for public charities. An Englishman feels all the pains which a fellow-creature suffers, and poor and miserable objects are relieved in England

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with a liberality that may prove injurious to industry ; because it takes from the lower ranks the usual motives of labour, that they may save somewhat for themselves and families against the days of age and sickness. The very people who contribute to those collections are assessed in proportion to their property for their parochial poor, who have a legal demand for a maintenance ; and upwards of three millions is said to be collected yearly in this country for charitable purposes."

In a general view of the agriculture of one of the counties in Scotland, drawn up for the consideration of the Board of Agriculture, I read the following paragraphs :

" In all transactions between the land-holders and tenants there is a double counteracting influence. The relation which they have as proprietor and occupier of the same ground, unites them by the strongest ties of interest against the consumer, from whom it is their mutual object to extort the highest price for every article of produce. They are generally not less accordant against those dangerous innovators, who, in the wantonness of undeserved prosperity, are apt to spring forth among the manufacturing and mercantile classes, maintaining doctrines subversive of the established orders of society, menacing the country with desperate agrarian systems, tending to destroy the sacred rights of property, and every species of security, and, under false pretexes of false distribution, founding the tocsin of anarchy and confusion.

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“ It must be confessed, however, that this observation concerning the constitutional sentiments of the farming interest is liable to great exceptions. In the vicinity of some towns where the notions of manufacturers predominate, the farmers have been so far perverted as to form associations, binding themselves under severe penalties never to offer any mark of civility to any person in the character of a gentleman. The consequences are, that they become boorish and brutal to every individual of the human species, and savage to the brute creation. These outrageous manners are considerably increased by the harshness and austerity which characterise different sectaries who abound in this county. Whenever this degrading tendency prevails, it becomes the duty of all persons connected with property in land, to form counter-associations, binding themselves never to grant leases to persons of such description ; at all events till this malady subsides, to grant no leases but from year to year, and to tenants at will.

“ The indolence of former times and feudal prejudices among the upper orders, which formed lines of demarkation and repulsion between them, have fortunately been modulated into more active and more easy habits. Improvements in dress, living, and conveniences of life, have increased beyond all credibility ; but the manners and morals of different ranks have, by no means, ameliorated in the same proportion. On the contrary, the civil cordial manners of the former generation are wearing fast away, and

in their place is substituting a regardless brutal democratic harshness of demeanour.

“ To the clergy of this country the public is already much indebted, and may derive still greater benefit from their exertions. The intelligence and understanding which distinguish the individuals of this deservedly respected order, together with their professional intercourse among all classes of their parishioners, render them peculiarly adapted for the propagation of useful knowledge, not in matters of religion only, but touching temporal concerns connected with the welfare of the community.

“ With respect to the upper classes of the proprietors, or freeholders and commissioners of supply, there are about 180 persons of these descriptions * (of whom 114 are voters belonging to the county), with estates from 100l. or 200l. to 2000l. per annum †. Several of these families have been of very ancient standing; but the greatest number of old families have, within the present century, been obliged to sell their property, embarrassed by the reigning spirit of conviviality and speculation, disproportioned to their income ‡.

* “ There are also five or six peers’ families of great property.”

† “ The largest estates in the county are about 10,000l. per annum, but the holders of them have property in other counties, which makes their income 20,000l. per annum.”

‡ “ Many farmers have remained on the same land for 30 or 40 years, and every right-minded landlord gives of course the preference to old tenants. It is difficult, however, to obtain any considerable rise of rent, or to introduce a system of improvement but by means of new ones.”

“ Indeed,

“ Indeed, considering the expense and inattention to affairs, connected with the situation of a country gentleman, and natural tendency of counting upon imaginary rentals long before they become real ones, including too the prevailing course of entertaining, drinking, hunting, electioneering, show, equipage, and the concomitant attacks upon the purse, and misapplication of the time, it appears surprising that any property unentailed should remain above two generations in the same succession, especially in this part of the island, where the gentry have not, as in England, the resource of clearing from time to time their pecuniary embarrassments by large sales of timber from their woods, hedge-rows, and plantations.”

On this subject I shall make a few brief observations.

If the relation of the mercantile and manufacturing classes be true, these people are very blameable. Equality in property is what, in the nature of things, cannot be : It never was, nor can it ever take place among men. Indeed wherever such a system has been attempted, it has never failed to bring destruction upon its promoters ; it is a doctrine which is diametrically opposite to all laws both human and divine*.

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* History informs us, that about the year 1520 a sect arose in Germany, who, pretending that Christians being all free, equal, and independent, maintained that there ought to be no tribunal among them, nor laws, nor any distinction of property ; but that every thing should be in common, nor any restraint with regard to the number of wives which they might marry. Their sermons were, for the most part, declamations against the

With regard to those who form associations, and bind themselves under penalties never to offer respect to any person in the character of a gentleman, they are certainly not in the way of duty. That these may be convinced of their error, I would advise them to read their Bibles, and, in particular, the second chapter of the First Epistle of the Apostle Peter; it is there said, "Submit yourselves to every ordinance of man for the Lord's sake; whether it be to the king as supreme, or unto governors, as unto them that are sent by him for the punishment of evil doers, and for the praise of them that do well: For so is the will of God, that with well-doing ye may put to silence the ignorance of foolish men; as free, and not using your liberty for a cloke of maliciouſness, but as the servants of God. Honour all men; love the brotherhood; fear God; honour the king."

With respect to the imputation of democratical principles and behaviour, I am afraid they are begotten by aristocratical ones. It cannot be expected that tenants will like to pay that passive obedience and non-resistance to their landlord, as servants in general do to their masters, or a regiment of soldiers

communion of the reformed; and they were incessantly exhorting every body to join with them, who, as they said, were sent of God to re-establish the kingdom of his Son; but it is evident they were not sent of God, for God never did, nor never will, authorise men to do evil. This sect even proceeded to establish their abominable political doctrine by force; but they were soon overcome, and their leader was punished with a most painful and ignominious death.

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does to its commander. In order, therefore, to cure this infectious malady, which the author says has been communicated to the farmers by means of the manufacturers, let the proprietors of land give to their tenants leases of a sufficient length, and at such a rent as they may be able to maintain their families in a decent comfortable manner; and let landlords require no other homage of their tenants, but to pay punctually their stipulated rent.

The epithets Democrat, Aristocrat, &c. seem to be too much in vogue. The British constitution is, in my opinion, the best of any in Europe. Had I leisure, I would endeavour to exhibit some of its excellencies; but as I have not, I shall only observe, that the principles of all the people of Great Britain ought to correspond with its constitution. On this account, therefore, those who are in any shape trying to set up either a monarchical, aristocratical, or democratical form of government, independent of the other two, are equally unfriendly to the British constitution.

In the general view of the county before mentioned, the author says, that great improvements in agriculture have of late years been made there; but in order to effect this, it was necessary to bind down the tenants to a certain mode of cropping. This method of procedure is, however, censured by a respectable clergyman who resides in one of the parishes belonging to the county hinted at: He says, "Every intelligent farmer in this district is now sensible that a proper rotation of crops is of the utmost importance in hus-

bandry, and that the ground with the same manure will continue in equal, or even in better heart for at least double the time under a rotation properly calculated for the soil, than what it will do under a constant succession of any one crop. The same method, however, does not suit all different soils, and perhaps the rotation that is most proper for each different soil has not been so much attended to any where as it ought to have been, and is yet, in a great measure, left uncertain; but the proprietors of land in this part of the country have almost universally adopted a plan of letting their grounds, which, in a great measure, prevents tenants from making use of any rotation. In their leases they bind the farmer to plow only three years, and then to keep the ground six years in grass. The leases are generally for 19 years, so that a farmer has it only in his power during that term to have two breaks of his farm, together with what he can plow in the last year of his lease. This plan is attended with great disadvantages to the proprietor, to the tenant, and to the public. Under such restriction the whole efforts of the tenant to meliorate his ground are confined to the first break; then he limes and dungs to the utmost of his power, and more especially endeavours to lay down his fields as richly as possible, in order that he may have good returns during the course of the second break, without being at farther expense at a period of the lease when he cannot receive the full benefit of it: The consequence of this is, that the greater part of the grounds are reduced to a very poor state before the end of the lease,

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The tenant again, when he has brought his grounds to a state in which they could more easily than at first be rendered more productive, is restrained in his exertions; because he cannot reap the full benefit arising from them, but must probably leave it to another, or pay a higher rent for it himself than he would otherwise have done; and thus his interest is materially hurt, while the public suffers likewise, as more grain would, undoubtedly, have been raised had the farmer had equal encouragement to exert himself as much in the latter part of the lease as he found it for his interest to do in the former. Besides, the term of tillage is too short to allow any proper rotation of crops: The ground is sown with oats when first broke up, and every one knows that the second year after the breaking up affords the best crop of oats. These two years, therefore, the ground must be sown with the same species of grain, to enable the farmer to pay his rent; and he can only make a change to another in the last of that break.

“ Thus they are nearly deprived of the power of observing any regular rotation, and every one must see the disadvantage that this must prove to all concerned. The only reason given for this restraint is, to put it out of the power of the farmer to run out his grounds at the end of the lease.

“ But though he cannot, in consequence of this restriction, over-plow them, yet, by doing little or nothing during the last break, he leaves them in a condition poor enough to be highly detrimental to the interest of the proprietor, while it proves an effectual

effectual check to the genius of the farmer, and prevents his trying many useful experiments by which both tenant and landlord, and indeed the public at large, would be benefited.

“ Perhaps it might be more expedient to let leases upon one or more lives, leaving the period of their termination uncertain; or the tenants might be allowed to plow as much for four years as they could properly manure the third year, which would be a great encouragement to their exertions.” *Statistical Accounts*, vol. ii.

“ It is but of late that the landlords have begun to pay any attention to the farm-houses on their estates. In general, however, a stranger still views with concern the poor mean-looking huts in which the farmers are condemned to dwell throughout all this county; their habitation, and that of their cattle, are generally under the same roof, and only separated from one another by partitions. Scarcely any of them have an upper story, so that the whole family are obliged to sleep upon the ground on a damp soil, where the floor is not so much as paved with stone or flags, and where there is not even a fire-place to draw off the moist and stagnant air. This must be attended with the worst consequences to the health of the people; whereas, were better and more comfortable houses provided for the tenants, it would be a great inducement to them to pay better rents for the farms, and it would even be a means of enabling them to do so, by giving them greater security for their health, and rendering them better able to at-
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tend their business. Every house, therefore, ought to have as much of it raised to a second story as would furnish the whole family with sufficient room to sleep above stairs, with vents in every sleeping apartment, in which fires might be put occasionally, and which would, at any rate, act as ventilators, and, by keeping up the circulation of the fresh air, would render consumptive complaints, at present so fatal, much less frequent.

“ The plain of Cunninghame, of which the parish makes a part, when viewed from the high grounds of Kyle, lies in the form of a large and beautiful amphitheatre, above 20 miles in diameter, and is esteemed by all who have viewed it as naturally one of the most delightful vallies to be seen in Great Britain. But the principal part of it being the property of some great landlords, there are of consequence but few gentlemen's houses in it. It is, therefore, the more necessary that it should be ornamented with neat and good-looking farm-houses, and with a considerable number of groves and plantations of trees, in order to give it a thriving and prosperous appearance. It is to be hoped that this will be brought about ; and, perhaps, no objects are better entitled to the attention of a public-spirited society than to encourage the planting of forest timber, and to improve the accommodation of our husbandmen, who are justly to be accounted not the least valuable part of the community.”

From what I have stated, I think it is evidently clear that proprietors of land in general act more with
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a view to the increase of their rents, than they do to the improvement of agriculture. To this, however, there are a great number of exceptions; I could mention several, but one or two may suffice:

The principal causes of the increase of population in the parish of Gamrie, are the number of fishing towns on the coast, the breaking of large farms into smaller ones, the encouragement given by the proprietors to improve waste ground, and their endeavouring to introduce a better mode of culture. The principal town in the parish is Macduff, the property of Lord Fife. In 1732 there were only a few fishermen's houses in Macduff; but now there are several well-laid-out streets, and about 1000 souls in the town. The harbour, on which his Lordship has already laid out upwards of 5000*l.* will, when finished, be one of the best in the Moray Firth. Since the great increase of population in this part of the parish, his Lordship has erected a chapel in Macduff for the accommodation of the inhabitants, who are nearly six miles from their parish-church, and gives a salary to a qualified clergyman to preach and dispense the ordinances of religion among them.

Earl Fife does not reside in the parish, but one of his principal seats is very near it. His Lordship has paid the greatest attention to the improvement of his estates and the good of the country, by encouraging inclosing, binding his tenants to have yearly a certain quantity of their ground in turnep, so much in fallow, and so much laid down in grass-seeds. These regulations were highly proper and necessary some years ago,

ago, because people are led in chains by habit, and it is by slow degrees and well-directed plans they are made to depart from established customs; but now that the propriety of these regulations is seen, it would be difficult to make the farmers have such small quantities of turneps, &c. as it was necessary at first to restrict them to. Earl Fife has also converted the whole customs and services (usually called *bondage*) at a moderate rate: This is of the utmost importance to the tenants. Not many years ago many of them paid nearly one half of their rent in fowls, eggs, sheep, &c. delivered in kind; and the labour of themselves, their servants, and horses in feed-time and harvest, carriage of peats, and many other works in the different seasons throughout the year when called for, by which means they were often obliged to plow, harrow, and dung their landlord's ground, and lose the season for their own.

Planting is a mode of improvement in which no person in this country has been more successful than the Earl of Fife. His Lordship has planted not less than from 7000 to 8000 acres on his different estates, which he continues yearly to increase; and at this time the whole is in a thriving state. An account of the various kinds of trees, and the method taken to rear them, will be seen in Young's *Annals of Agriculture*, and the *Minutes of the Society of Arts, Manufactures, and Commerce*. The most considerable plantation in the parish of Gamrie is what is called the *Tore of Troup*; which consists of about 600 acres, planted with trees of various kinds

in a thriving state. These were raised chiefly by the direction of Mr. Garden of Troup, and begun by his grandfather. Mr. Garden was unanimously elected Member of Parliament for the county of Aberdeen during three succeeding sessions. He constantly resided at Troup in the parish of Gamrie, excepting the time he attended parliamentary business, and paid great attention to the improvement of his estate and the good of his country. He never gave a shorter lease than a life, and to several of the tenants he gave very long leases. He was not, like many others, who, when they saw a tenant thriving, thought he had too good a bargain, and would demand a very high rent at the next letting; it was his joy to see his tenants carrying on their improvements, and prospering by their honest industry. Nor when any of his leases fell vacant, was it ever known that he did not prefer the tenant's own son, and continue him in the possession, if he was disposed to follow the same occupation with his father. And it may be safely said, that, owing to the encouragement given by Earl Fife and Mr. Garden, there are few tenants in the north of Scotland more thriving than in the parish of Gamrie. In the year 1782, when many others were not able to pay their rents, scarcity was not much felt except by the poorest class.

This relation deserves to be recorded; and if noblemen and gentlemen would in general condescend to follow the laudable example, I have no doubt but that they would be more and more revered by their tenants and all the lower classes, and we should
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soon hear of the democratical monster having received a mortal wound, and lying gasping his last breath at the feet of a mixed monarchy.

An indigent tenantry is a great misfortune to any country where it so happens; for whatever may be the native advantages of the soil, or even the skill and industry of the occupier, the want of a sufficient capital confines every plan, as well as cripples and weakens every operation of husbandry. This evil is felt where agriculture is accounted a mean or servile employment; where farms are too much divided, and badly furnished with habitations; where leases are unknown, or are of short or precarious duration. With respect to the encouragement of agriculture, in this, as in every other employment, the true reward of industry is in the price and sale of the produce. The exclusive right to the produce is the chief and only incitement which acts constantly and universally, and the sole spring which keeps the husbandman's labour in motion. It seems, therefore, that the laws can do no more than secure this right to the occupier, that is, to constitute such a system of tenure, that the full and entire advantage of every improvement go to the benefit of the improver; that every man work for himself and not for another; and that no one share in the profit who does not assist in the production. By the occupier I here mean not so much the person who performs the work, as him who procures the labour, and directs the management; and I consider the whole profit as received by the occupier, when the occupier is benefited by the whole value of

what is produced, which is the case with the tenant who pays a fixed rent for the use of land, no less than with the proprietor who holds it as his own. The one has, in general, the same interest in the produce, and in the advantage of every improvement, as the other. I think the proprietor, though he let out his estate to farm, may, in a manner, be still considered as the occupier, that is, in so much as he regulates the occupation by the choice, superintendency, and encouragement of his tenants, by the disposition of his lands, by erecting buildings, providing accommodations, by prescribing conditions, or supplying implements and materials of improvement; and is entitled, by the rule of public expediency, to receive in the advance of his rent a share of the benefit which arises from the increased produce of his estate. The violation of this fundamental maxim of policy constitutes the chief objection to the holding of lands by the state, by the king, by corporate bodies, by private persons, in right of their offices, or benefices.

The inconveniency to the public arises not so much from the unalienable quality of lands thus holden in perpetuity, as from hence, that proprietors of this description seldom contribute much either of attention or expense to the cultivation of their estates, yet claim, by the rent, a share in the profit of every improvement that is made upon them. This complaint, it would seem, can only be obviated by long leases at a fixed rent, which convey a large portion of the interest to those who actually conduct the cultivation. The same objection is applicable to the holding

holding of lands by foreign proprietors, and, in some degree, to estates of too great extent being placed in the same hands.

Next to the indispensable requisites of internal peace and security, the chief advantage which can be derived from the interference of law appear to me to consist in the encouragement of agriculture. This is certainly the direct way of increasing the number of the people, every other mode being effectual only by its influence upon this. Now the principal expedient by which such a purpose can be promoted, is to adjust the laws of property as nearly as possible to the two following rules: First, to give the occupier all the power over the soil which is necessary for its cultivation; second, to assign the whole profit of every improvement to the persons by whose activity it is carried on. What I call property in land is a power over it. It is indifferent to the public in whose hands this power resides, if it be rightly used; for it matters not to whom the land belongs, provided it be but well cultivated. When we lament that great estates are often united in the same hand, or complain that one man possesses what would be sufficient for a thousand, we suffer ourselves to be misled by words. The owner of ten thousand pounds a year consumes no great deal more of the produce of the soil, than the owner of ten pounds a year. If the cultivation be equal, the estate in the hands of one great lord affords subsistence and employment to the same number of persons, as it would do if it were divided amongst a hundred proprietors. In like manner we ought to

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judge of the effect upon the public interest, which may arise from lands being holden by the king, or by the subject, by private persons, or by corporations, by laymen, or ecclesiastics, in fee or for life, by virtue of office, or right of inheritance. However, I do not mean that these varieties make no difference; but I mean that all the difference they do make respects the cultivation of the lands which are so holden.

In this country there exist conditions of tenure which condemn the land to perpetual sterility. Of this kind is the right of common, which precludes each proprietor from the improvement, or even the convenient occupation, of his estate, without what seldom can be obtained, that is, the consent of many others. This tenure is also usually embarrassed by the interference of manorial claims, under which it often happens that the surface belongs to one owner, and the soil to another, so that neither owner can stir a clod without the concurrence of his partner in the property. In many manors the tenant is restrained from granting leases beyond a short term of years, which renders every plan of solid and permanent improvement impracticable. In these cases the owner wants what the first rule of rational policy requires, that is, sufficient power over the soil for its good cultivation. This power ought to be extended to him by some easy and general law of enfranchisement, partition, and enclosure, which, though compulsory upon the lord or the rest of the tenants whilst it has in view the melioration of the soil, and gives an equal compensation for every right that it takes away, is
neither

neither more arbitrary, nor more dangerous, to the stability of property than that which is done in the construction of roads, navigable canals, and in almost every public work in which private owners of land are obliged to accept that price for their property which an indifferent jury may award.

Agriculture is discouraged by every constitution of landed property which lets in those, who have no concern in the improvement, to a share in the profit. This objection is applicable to all such customs of manors as subject the proprietor, upon the death of the lord or tenant, or the alienation of the estate, to a fine proportioned to the improved value of the land. But of all institutions, which are in this way adverse to cultivation and improvement, none seems to be so noxious as that of tithes. Some claimants here enter into the produce who contribute no assistance whatever to the production; the laity, who enjoy appropriations or impropriations, seem to be of this kind. When years perhaps of care and toil have matured an improvement, and when the husbandman sees new crops ripening to his skill and industry, the moment he is ready to put his sickle into the grain, he finds himself compelled to divide his harvest with a stranger. Tithes are not only a tax upon industry, but upon that industry which feeds mankind, upon that species of exertion which it is the aim of all wise laws to cherish and promote, and to uphold and excite; which composes the main benefit that the community derives from the whole system of trade, and the success of commerce. And together with the

more general inconveniency that attends the exaction of tithes, there is this additional evil in the mode at least according to which they are often collected, that they operate as a bounty upon pasturage. The burden of the tax falls with its chief if not with its whole weight upon tillage, that is to say, upon that precise mode of cultivation which it is the business of the state to relieve and reward in preference to every other.

To improve land with profit, like all other commercial projects, requires an exact attention to small savings and small gains, of which a man, born to a great fortune, even though naturally frugal or industrious, is very seldom capable. The situation of such a person naturally disposes him to attend rather to ornament, which pleases his fancy, than to profit, which he has so little occasion for. The elegance of his dress, of his equipage, of his house and household furniture, are objects which, from his infancy, he has been accustomed to have some anxiety about. The turn of mind which this habit naturally forms, follows him when he comes to think of the improvement of land. He perhaps embellishes four or five hundred acres in the neighbourhood of his house, at ten times the expense which the land is worth after all his improvements, and finds that if he was to improve his whole estate in the same manner (and he has little left for any other), he would be a bankrupt before he had finished the tenth part of it. There are still in both parts of the united kingdom some great estates which have continued without interrup-

tion in the hands of the same family since the times of feudal confusion. Compare the condition of those estates with the possessions of the small proprietors in their neighbourhood, and you will require no other argument to convince you how unfavourable such extensive property is to improvement.

In the ancient state of Europe the occupiers of land were all tenants at will, they were all, or almost all, slaves; but their slavery was of a milder kind than that known among the ancient Greeks and Romans, or even in our West Indian colonies. They were supposed to belong more directly to the land than to their master; they could therefore be sold with it, but not separately. They could marry, provided it was with the consent of their master; and he could not afterwards dissolve the marriage by selling the man and wife to different persons. If he maimed or murdered any of them, he was liable to some penalty, though generally but to a small one. They, however, were not capable of acquiring property; whatever they acquired was to their master, and he could take it from them at pleasure. Whatever cultivation and improvement could be carried on by means of slaves was properly carried on by their master—it was at his expense; the seed, the cattle, and the instruments of husbandry, were all his, and all was done for his benefit. Slaves could acquire nothing but their daily maintenance; it was therefore properly the proprietor that in this case occupied his own lands, and cultivated them by his own bondmen. This species of slavery, I am credibly informed, still exists in Russia, Poland, Hungary, Bohe-

mia, Moravia, and other parts of Germany. It is only in the western and south-western parts of Europe that it has been altogether gradually abolished ; but if great improvements are seldom to be expected from very great proprietors, they are least of all to be expected when they employ slaves for their workmen. The experience of all ages I think clearly proves, that the work done by slaves, though it appears to cost only their maintenance, is, in the end, the dearest of any. A person who can acquire no property, can have no other interest but to eat as much, and labour as little, as possible. Whatever work he does beyond what is sufficient to purchase his own maintenance, can be squeezed out of him only by violence, and not by any interest of his own. It is remarked both by Pliny and Columella how much the cultivation of corn degenerated, and how unprofitable it became to the master when it fell under the management of slaves in ancient Italy.

The natural pride of man makes him love to domineer, and nothing gives him so much mortification as to be obliged to condescend to persuade his inferiors. Therefore, whenever the law allows, and the nature of the work can afford it, he will generally prefer the service of slaves to that of free men. It is said, that the planting and cultivating of sugar and tobacco can afford the expense of purchasing and employing slaves*. The profits of a sugar plantation

* I here take the opportunity of giving my decided disapprobation against the continuation of the slave trade. In my opinion it is a disgrace to any nation professing Christianity to sanction a traffic in their fellow-mortals.

in our West Indian islands are generally much greater than those of any other cultivation that is known either in Europe or America ; and the profits of a tobacco plantation, although inferior to those of sugar, are said to be superior to those of corn. Both can afford the expense of slave cultivation, but sugar can afford it better than tobacco ; therefore the number of slaves is much greater in proportion to that of free men in our sugar, than in our tobacco, colonies.

A species of farmers, lately known in France by the name of Metayers, succeeded the slave cultivators of ancient times. The proprietor furnished them with seed, cattle, the instruments of husbandry, in short the whole stock for cultivating the farm. The produce, it is said, was divided equally between the proprietor and the farmer, after setting aside what was judged necessary for keeping up the stock, which was restored to the proprietor when the farmer quitted, or was turned out of the farm.

Ground occupied by tenants of such a description is as properly cultivated at the expense of the proprietor as that occupied by slaves. However, there is one essential difference between them ; for such tenants being free men, are capable of acquiring property, and, having a certain proportion of the produce of the land, they have an interest that the whole produce should be as great as possible, in order that their own share should be so. A slave, on the contrary, who can acquire nothing but his maintenance, consults his own ease, by making the land produce

as little as possible over and above that maintenance. It is probable that it was partly on account of this advantage, and partly on account of the encroachments which the sovereign, always jealous of the great lords, gradually encouraged their villains to make upon their authority, and which seem at last to have been such as rendered this species of servitude very inconvenient, that tenure in villainage wore out through the greater part of Europe; however, the time and manner in which so important a revolution was brought about is one of the most obscure points in modern history. Great merit is claimed in it by the church of Rome; and it is true that, so early as the twelfth century, the pope published a bull for the general emancipation of slaves: It seems, however, to have been rather an exhortation, than a law to which exact obedience was required. Indeed slavery continued to take place almost universally for some centuries afterwards, till it was gradually abolished by the joint operation of the two interests above mentioned, that of the proprietor on the one hand, and that of the sovereign on the other. A villain* enfranchised, and, at the same time, allowed to continue in possession of the land, having no stock of his own, could cultivate it only by means of what the proprietor advanced to him, and must therefore be

* The word Villain formerly meant a man that was obliged to do mean offices, or hard labour of farming, as a tenure by which he held his lands; but now it generally means a wicked profligate fellow, that sticks at nothing to bring about his designs, whether robbery, theft, &c.

similar

Similar to what the French called a Metayer. However, it could never be the interest even of this last species of cultivators to lay out in the further improvement of land any part of the little stock which they might save from their own portion of the produce; because the lord, who laid out nothing, was to get one half of whatever it produced. The tithe, which is but a tenth of the produce, is found to be a hindrance to improvement; therefore a tax, which amounted to one half, must have been an effectual bar to it. It might be the interest of a cultivator that paid the lord one half of the produce, to make the land produce as much as could be brought out of it by means of the stock furnished by the proprietor; but it could never be his interest to mix any part of his own with it.

A similar species of tenants, it is said, still subsists in some parts of Scotland; they are by some called steel-bow tenants. Those ancient English tenants, who are said by Doctor Blackstone and Chief Baron Gilbert to have been rather bailiffs of the landlord than farmers properly so called, were probably of the same kind.

In England a lease for life of forty shillings a year value is a freehold, and entitles the lessee to vote for a member of parliament; and as many of the yeomanry have freeholds of this kind, the whole order becomes respectable to their landlords on account of the political consideration this gives them. In Scotland, as no leasehold gives a vote for a member of parliament,

parliament, the yeomanry are upon this account less respectable to their landlords than in England.

The law which secures the longest leases against successors of every kind, seems, as far as I know, to be peculiar to Great Britain. Its beneficial influence, however, has, it is said, been much obstructed by entails, the heirs of entail being generally restrained from letting leases for any long term of years.

The proprietors of land were anciently the legislators of every part of Europe; therefore the laws relating to land were all calculated for what they supposed the interest of the proprietor. It was for his interest they had imagined that no lease granted by his predecessors should hinder him from enjoying, during a long term of years, the full value of his land. Avarice and injustice are frequently short-sighted, and they did not foresee how much this regulation must obstruct improvement, and thereby, in the course of time, hurt the real interest of the landlord.

The farmers in some parts of the country were anciently bound to perform a great number of services to the landlord, which were seldom either specified in the lease, or regulated by any precise rule, but by the use and wants of the barony or manor. These services, being almost entirely arbitrary, subjected the tenant to many vexations. In Scotland the abolition of all services, not precisely stipulated in the lease, has, in the course of a few years, altered for the

the better the condition of the tenantry of that country.

By history we are informed, that when the German and Scythian nations over-run the western provinces of the Roman empire, the confusions which followed such a great revolution lasted for several centuries. The rapine and violence exercised by the barbarians against the ancient inhabitants, interrupted the commerce between the towns and the country. So the towns were deserted, and the country was left almost uncultivated; and the western provinces of Europe, which had enjoyed a considerable degree of opulence under the Roman empire, sunk into the lowest state of poverty and barbarism. While those confusions continued, the chiefs and principal leaders of those nations acquired, or usurped, to themselves the greater part of the lands of those countries. A great part of them was uncultivated; but no part of them, whether cultivated or uncultivated, was left without a proprietor; all of them were engrossed, and the greater part by a few great proprietors.

This original engrossing of uncultivated lands, though a great, might have been but a transitory, evil; they might have soon been divided again, and broke into small parcels, either by succession, or by alienation: The law of primogeniture hindered them from being divided by succession, the introduction of entails hindered their being broke into small parcels by alienation.

When land, like moveables, is considered as the means only of subsistence and enjoyment, the natural law

law of succession divides it, like them, among all the children of the family, of all of whom the subsistence and enjoyment may be supposed dear to the father. This natural law of succession accordingly took place among the Romans, who made no more distinction between the elder and younger, between male and female, in the inheritance of lands, than we do in the distribution of moveables. But when land was considered as the means not of subsistence merely, but of power and protection, it was thought better that it should descend undivided to one. In those disorderly times every great landlord was a sort of petty prince; his tenants were his subjects, he was their judge, and in some respects their legislator in peace, and their leader in war. He made war according to his own discretion, frequently against his neighbours, and even sometimes against his sovereign. The security, therefore, of a landed estate, and the protection which its owner could afford to those who dwelt on it, depended upon its greatness: To divide it was to ruin it, and to expose every part of it to be oppressed and swallowed up by the incursions of its neighbours. The law of primogeniture, therefore, came to take place, not immediately, but in process of time, in the succession of landed estates; for the same reason that it has generally taken place in that of monarchies, though not always at their first institution. That the power and consequently the security of the monarchy may not be weakened, it must descend entire to one of the children. To which of them so important a preference shall be given must be determined

mined by some general rule, founded not upon the doubtful distinctions of personal merit, but upon some plain and evident difference, which can admit of no dispute. Among the children of the same family there can be no disputable difference but that of sex, and that of age. The male sex is universally preferred to the female; and when all other things are equal, the elder every-where takes place of the younger. Hence the origin of the right of primogeniture, and of what is called lineal succession.

Laws frequently continue for a long time in force after the circumstances which gave occasion to them, and which could alone render them reasonable, are no more. In the present state of Europe, the proprietor of a single acre of land is as perfectly secure of his possession as the proprietor of many thousands. The right of primogeniture, however, still continues to be respected; and as, of all institutions, it is the fittest to support the pride of family distinctions, it is likely to endure for many years. In every other respect, nothing can be more contrary to the real interest of a numerous family than a right, which, in order to enrich one, impoverishes all the rest of the children.

Entails are the natural consequences of the law of primogeniture: They were introduced to preserve a lineal succession, of which the law of primogeniture first gave the idea; and to prevent any part of the original estate from being carried out of the proposed line, either by gift, devise, or alienation; either by
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the folly or by the misfortune of any of its successive owners.

One great end and reason for the institution of laws is the protection of every man's property. The establishment and protection of property, by the constitution, laws, and government of this, or of any other nation, is of great importance, and contributes much towards the improvement of agriculture.

In climates like ours the earth produces little without cultivation; and no person would be found willing to cultivate the ground if others were to be admitted to an equal share of the produce. Wild deer, rabbits, game, fish, nuts, and wild apples, are almost all we should have to subsist upon, if we trusted to the spontaneous productions of this country. In some fertile soils, with abundance of fish upon their coasts, and in regions where clothes are not wanted, a considerable degree of population may subsist without property in land, which is the case in some of the lately found out islands; but in less favoured situations, as in the country of New Zealand, though this sort of property obtain in some degree, the inhabitants, for want of a more secure and regular establishment of it, are said to be driven sometimes, by the scarcity of provision, to devour one another.

We may form some judgment of what would be the effects of a community of right to the productions of the earth, from the small specimens that we at present see of it. Nuts in a wood, cherry-trees in a hedge-row, the grass in common pasture, are
seldom

seldom of much advantage to any body ; because people do not wait for the proper season of gathering and using them. In like manner corn, if any were sown, would perhaps not be permitted to ripen ; calves and lambs would never be suffered to grow up to cows and sheep, because the first person that met with them would consider that he had better take them as they are than leave them for another. Confusion and tumult, war and waste, must be unavoidable and continual, where there is not enough for all ; and where there are no rules or authority to settle and adjust the division.

Property being secured enables mankind to divide themselves into distinct professions, which is impossible, unless a man can exchange the productions of his own art for what he wants from others ; much of the advantage of civilized over savage life depends upon this. When a man is, from necessity, his own shoemaker, taylor, smith, and carpenter, it is not probable that he will be very expert at either of his callings. Hence the rude habitations, furniture, clothing, and implements of savages, and the tedious length of time which all their operations require.

The protection of property also encourages those arts by which the accommodations of human life are supplied, by securing to the artist the benefit of his discoveries and improvements, without which security ingenuity will never be exerted with much effect.

Upon these several accounts we may, with a few exceptions, venture to pronounce, that even the poorest

poorest and worst-provided people, in countries where property, and the consequences of property, prevail, are in a better situation, with respect to food, raiment, houses, and what are called the necessaries of life, than people are in places where most things remain in common. Inequality of property, in the degree in which it exists in most countries of Europe, abstractedly considered, is undoubtedly an evil; but it seems to be an evil which flows from those rules which concern the attainment and disposal of property, by which men are prompted to industry, and by which the object of their industry is rendered secure and valuable. If there be any great inequality, unconnected with the original of this, it ought to be rectified.

There is scarce any thing which so generally strikes the imagination, and engages the affections of mankind, as the right of property; or that sole and despotic dominion which one man claims and exercises over the external things of the earth, to the entire exclusion of the right of any other individual in the world. However, there are very few that will give themselves the trouble to consider the original and foundation of this right: Being pleased with the possession, they are generally afraid to look back to the means by which it was acquired, as if fearful of some defect in the title; or at least they rest satisfied with the decision of the laws in their favour, without examining the authority or reason upon which those laws have been built. They think it sufficient that their title is derived by the grant of the former propri-

proprietor, by descent from their ancestors, or by the last will and testament of the deceased owner; not minding to consider, that, strictly and accurately speaking, there is no foundation in nature, or natural law, why a set of words upon paper or parchment should convey the dominion of land; or why the son should have a right to exclude his fellow-creatures from a limited spot of land, because his father had done so before him; or why the occupier of a particular piece of ground, when lying on his death-bed, and no longer able to keep possession, should be entitled to tell the rest of the world which of them should enjoy it after him. It must be owned these inquiries would be troublesome, and even useless in common life. Instead of too nicely scrutinizing the reasons for making the laws, it is well if the mass of mankind will obey them when made. Nevertheless, when law is to be considered, not only as matter of practice, but also as a rational science, surely it cannot be improper or useless more deeply to examine the rudiments and foundations of these positive constitutions of civil society.

By holy writ we are informed, that in the beginning of the world God Almighty gave to man, "dominion over all the earth, and over the fish of the sea, and over the fowl of the air, and over every living thing that moveth upon the earth." This is the only real and solid foundation of man's dominion over external things; therefore the earth, and all things therein, are the general property of all mankind, exclusive of all other beings,

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from the immediate gift of the Creator; and it is reasonable to suppose, that, while the earth continued bare of inhabitants, it was all in common among them, and that every one took from the public stock for his own use, such things as his immediate necessities required.

General notions of property like these, were then sufficient to answer all the purposes of human life, and perhaps might still have answered them, had it been possible for mankind to have remained in a state of primeval simplicity, as may be gathered from the manners of American nations, when first discovered by the Europeans; and from the ancient way of living among the first Europeans themselves, if we may credit the accounts given of those times by historians. Not that the communion of goods seems ever to have been applicable, even in the first ages, to any particular thing; but to the substance of the thing; nor could it be extended to the use of it; for, by the law of nature, and of reason, he who first began to use it, acquired therein a sort of property that lasted only as long as he was using it, or as long as he was in actual possession of it. Thus, in the first ages, the land was in common, and no part of it was the lasting property of any person in particular, notwithstanding, whoever was in the occupation of any limited spot of it for shelter, for rest, or such like, acquired for the time a kind of ownership, from which, according to the law of nature, it would have been unjust to have driven him by force; but the very instant that he quitted the occupation or use of

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it, another, without injustice, might take it in like manner also; and yet another, might be said to begin common, all men being equally entitled to its fruit, and yet any person might gain the sole property of the produce which he had gathered for his own use.

It however became necessary, when mankind increased in number, ambitious and crafty men entertained conceptions of more lasting dominion, and to secure to individuals, not only the immediate use, but the very substance of the thing to be used; otherwise must have arisen innumerable tumults, and the good order of the world would continually have been broken and disturbed; while many persons were sitting about who should get possession of the thing first, or disputing which of them had really gained it. Also, as human life grew more and more refined, conveniences were in abundance devised to render it more agreeable, easy, and commodious; as habitations for safety and shelter, and clothing for decency and warmth. But no person would be at the trouble to provide either, so long as he had only an unsure property in them.

In ancient times, as well as now, in the case of habitations in particular, it might be observed, that even the brute creation, to whom every thing else was in common, maintained a kind of permanent or lasting property in their dwellings, especially for the protection of their young. That the birds of the air had nests, and the beasts of the field had dens; the invasion of which they deemed a very

great injustice, and would even sacrifice their very lives to preserve them. Hence was soon established a property in every man's house, which appear to have been originally mere huts, or moveable tents, suitable to the design of Providence for peopling the earth speedily, and fitted to the wandering life of their owners, before property in the soil became established.

There can be no doubt but that moveables became sooner appropriated than the lasting substantial land, partly because they could be more easily occupied, which might be continued for months together without any interruption, and by usage at length ripen into an established right; but principally because few of them could be fit for use, till meliorated and improved by the labour of the occupier; which bodily labour bestowed upon any thing which before lay in common to all men, is allowed universally to give the most reasonable and fullest title to an exclusive property therein.

As food, the article which every body wants, was a more immediate call, it was therefore a more early consideration; those who were not contented with the spontaneous productions of the earth, searched for a more palatable refreshment in the flesh of beasts, and which they obtained by hunting. But the common disappointments incident to this method of provision inclined them to gather together such animals as were of a tameable nature, and to establish a lasting property in their flocks and herds, in order to furnish themselves with food in a less precarious manner,

ner, partly by milk, and partly by flesh. The support of their flocks and herds made water a very important article. The most ancient and venerable monument of antiquity, merely considered with a view to history, I mean the book of Genesis, furnishes us with frequent instances of violent quarrels and contentions concerning wells of water, the exclusive property of which seems to have been established in the first digger or occupier, even in such places where the land and herbage yet remained in common. Thus we find Abraham, who was but a sojourner, asserting his right to a well in the country of Abimelech, and even exacting an oath of him for his security, and Isaac about ninety years afterwards claimed this his father's property. The soil and pasture of the earth all this while remained in common as before, and open to every occupier, except perhaps where the necessity of a sole and exclusive property in lands for the sake of agriculture, was earlier felt, and consequently more readily complied with; otherwise, when the multitude of men and cattle had consumed every subsistence on one spot of ground, it was reckoned a natural right to seize upon and occupy such other lands as would more easily supply their necessities. It is said that this practice is still in use among the wild and uncultivated nations, such as the Tartars, and others in the East that have never been formed into civil states; where the boundless extent of territory, and the climate, combine to retain them still in the same savage state of vagrant liberty, which, no doubt, was universal in the first ages, and

which is said to have continued among the Germans till the decline of the Roman empire. In the history of Abraham and his nephew Lot, we have also a striking example of the same kind. When their joint substance became so great, that pasture and other conveniencies grew scarce, the natural consequence was, that a strife arose between their servants, so that it was no longer practicable to live together. This dispute Abraham thus endeavoured to compose: Let, says he, there be no strife between thee and me. Is not the whole land before thee? Separate thyself, I pray thee, from me: If thou wilt take the left hand, then I will go to the right, or if thou wilt depart to the right, then I will go to the left. This evidently implies an acknowledged right in either to occupy whatever land he thought fit, that was not pre-occupied by other tribes.

The right of migration, or sending colonies to find out new habitations, was founded upon the same principle. This, we are informed, was practised by the Phœnicians, Greeks, Scythians, Germans, and other northern people; and so long as it was confined to the peopling and cultivating of deserted uninhabited countries, it kept strictly within the limits of the law of reason and nature. But how far the seizing on nations and countries already peopled, and driving out, massacring, or ill-treating, the inhabitants or natives, merely because they differed from their invaders in religion, in language, in colour, in customs, or in government, how far such a conduct was agreeable to nature, to reason, or to christianity, deserved well

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to be considered by those who have rendered themselves conspicuous by thus civilizing mankind. And such conduct still deserves to be well weighed by those great men at this day, who seem to be aiming more at their own aggrandizement in the extension of their dominions, than at the prosperity and happiness of mankind in general.

As by degrees the world became more populous, it became daily more difficult to find out new spots of land to inhabit, without encroaching upon the first occupiers; and by occupying one spot constantly, the fruits of the earth were consumed, and its spontaneous productions wasted, without proper provision for a future supply or succession. Therefore it became necessary to pursue some regular method of providing a continual subsistence, and this necessity of course produced, or at least promoted and encouraged, the art of agriculture; and by a regular connexion and consequence, the art of agriculture introduced and established the idea of a more secure and permanent property in the soil than had before then been received and adopted.

That the earth, without the assistance of tillage, would not produce her fruits, was evident; but who would be at the pains of tilling it, if another might watch an opportunity to seize upon and enjoy the productions of his art and labour? Therefore had not a separate property in lands, as well as moveables, been vested in some individuals, the world must have continued a wilderness or forest, and men been mere plundering animals of prey, which, at-

according to some philosophers, is the real state of nature.

It is clear that necessity begat property, and in order to protect that property, it was necessary to have recourse to civil society; which brought along with it a long train of inseparable concomitants, states, governments, laws, punishments, and the public exercise of religious duties! Being thus connected together, it was found that a part only of society was sufficient to provide, by their manual labour, for the necessary subsistence of all, and thereby leisure was given to others to cultivate the human mind, to invent useful arts, and to lay the foundation of science.

How this property became actually vested, or what it is that gave a person an exclusive right to retain or hold in a lasting manner that specific land which before belonged to every body, is the only query remaining to be solved.

As occupancy gave the right to the temporary use of the soil, and is agreed upon all hands that occupancy gave also the original right to the lasting or permanent property in the substance of the earth itself, which excludes everyone else but the owner from the use of it. As among the writers on natural law there is indeed some difference concerning the reason why occupancy should convert this right, and invest one with this absolute property in some instances that this right of occupancy is founded on a silent and implied assent of all mankind, that the first occupier should become the owner, others holding that there is no such implied assent, neither is there

there a necessity that it should be; for that the very act of occupancy alone being a degree of bodily labour, is, from a principle of natural justice, sufficient of itself to gain a title without any consent or compact: Such dispute seems to favour too much of nice and scholastic criticism. It is, however, I believe, agreed upon on all sides, that occupancy is the thing by which the title was in fact originally gained, every man taking possession to his own continued use of such spots of land as he found most agreeable to his own convenience, provided he found them unoccupied by any other person.

Property in lands and in moveables being thus originally attained by the first taker (which taking amounts to a declaration that he intends to set aside the thing to his own use), it remains in him, by the principles of general law, till such time as he does some other act, which shows an intention to forsake it; for then it becomes once more vacant, and is liable again to be appropriated by the next occupier.

But this method of one man's forsaking his property, and another seizing it, however well founded in theory, could not long continue in practice. It was merely calculated for the beginnings of society, and necessarily ended among the complicated interests and artificial refinements of polite and established governments. For in these it was found that what became of no use to one man, was highly useful to another, who was ready to give in exchange for it something that was at least equally desirable to the former proprietor. Mutual convenience thus introduced

duced commercial traffic, and the reciprocal transfer of property, by sale, grant, or conveyance, which may be considered either as a continuance of the original possession which the first occupier had, or as a forsaking of the thing by the present owner, and an instantaneous successive occupancy of the new proprietor. It is, undoubtedly, the intention of God that the productions of the earth be applied to the use of man. This intention cannot be fulfilled without establishing property; it is, therefore, certainly agreeable with his will that property be established. The land cannot be divided into separate property, without leaving it to the law of the country to regulate that division. It is consistent, therefore, with the same will that the law should regulate the division, and consequently consistent with the will of God, or right, that a man should possess that share which these regulations invest him with.

Hence it appears, that a man's right to an estate does not at all depend upon the manner or justice of the original acquisition; nor upon the justice of each subsequent change of possession. His right, for instance, is not the less, nor ought it to be impeached, because the estate was first taken possession of by a family who happened to be stronger than their neighbours; nor because the British possessor was turned out by a Roman, and the Roman by a Saxon invader; nor because it was seized, without colour of right, or reason, by a follower of the Norman adventurer, from whom, after many interruptions of fraud and violence, it has at length devolved to the present proprietor.

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Although the original of private property seems to be founded in nature, yet the modifications under which it is at present, the method of preserving it in the present owner, and of transferring it from one man to another, are altogether derived from society, and are some of those civil advantages, in exchange for which every individual has resigned a part of his natural liberty. Therefore, in point of honour and justice, the laws of England are exceedingly watchful in ascertaining and protecting his right. The great charter has, upon this principle, declared, that no free man shall be disseised or divested of his freehold, or of his liberties, or free customs, but by the judgment of his peers, or by the law of the land; and by a variety of statutes it is enacted, that no man's lands or goods shall be seized into the king's hands against the great charter and the law of the land, and that no man shall be disinherited, nor put out of his freehold, unless he be duly brought to answer, and be forejudged by course of law; and if any thing be done to the contrary, it shall be redressed.

And moreover, the law has so great a regard for private property, that it will not authorise the least violation of it, not even for the general good of the whole community. For instance, if a new road were to be made through the lands of a private person, it perhaps might be beneficial to the public; but the law permits no man, nor set of men, to do this without the consent of the owner of the land. It may be urged, but in vain, that the good of the individual ought to yield to that of the community;

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for it would be dangerous to allow any private man, or even public tribunal, to be the judge of this common good, and to decide whether it be expedient or not. The public good, besides, is in nothing more essentially interested than in the protection of every individual's private rights, as modelled by the established laws of the place. In this, and such-like cases, the legislator alone can, and even frequently does, interpose, and force the individual to comply; but in interposing, and compelling the individual to part with his private right, it does not strip him of his property in an arbitrary manner, but by giving him a full indemnification and equivalent for the injury thereby sustained. The only thing that the legislature does, is to oblige the owner to give his possessions for a reasonable price, and even this is a stretch of power which the legislature indulges with caution, and which nothing but the legislature can perform. Nor is land the only thing in which the law of the land has postponed even public necessity to the inviolable rights of private property; for no subject of the British empire can be forced to pay any taxes, even for the defence of the kingdom, or the support of government, but such as are laid on by his own consent, or that of his representatives in parliament.

Upon the whole, it seems that the institution of property was not intended to operate to the oppression of any individual, but, on the contrary, for the encouragement of agriculture, and for the good of all. Therefore, in whatever individual, or set of individuals, property, by the law of the land, is invested

to such an amount or degree that it becomes in any way hurtful to the community or oppressive to individuals, the legislature, and it only, in matters of this nature, has, I conceive, an undoubted right to interpose, and even is in duty bound to interpose, in the suppression of every evil which tends to the prejudice of the British constitution, as defined in the year 1688.

OF PLOWING AND FALLOWING.

THE great end of plowing and fallowing is to break and pulverize the soil for the more easy spreading of the roots of the plants, and their better nourishment, and for the destruction of weeds.

One material thing to be attended to is, the plowing at proper seasons. In general, land receives injury from being plowed in wet or snowy weather, at least it often tends to promote the growth of weeds, instead of destroying them. Land that is designed for winter fallow, should be plowed before the end of November, so that it may receive the full benefit of the frost; and, provided it be plowed clean, it cannot lie too rough. Land for summer fallow should be broken up in May, and the subsequent stirring should be a cross plowing, and if it be plowed shallower and deeper alternately during the summer, it will in general help to clean it better.

Deep plowing has been greatly recommended by some modern writers. This upon some lands is a commend-

commendable practice, but it requires some judgment to know what lands are likely to be benefited thereby. Upon particular lands, where the under stratum is found to be better than the top, a mixture is very beneficial; but when the top and bottom for 18 or 20 inches deep consist of the same soil, I do not believe it is ever worth while to exchange the upper part, which has been enriched for many years back, for a part less rich, merely on account of its being more fresh.

The roots of ordinary corn and grass do not require any great depth. In many parts of the country the land is exceeding fruitful, though the soil is extremely shallow; and in many counties they find by experience that they hurt their land by plowing below the usual depth.

The method of making the fallows very fine in May in order to destroy the weeds in June, is a good one; for the clods being broken, the moisture gets to the seeds of the weeds, and enables them to vegetate, and the next plowing destroys all of them which were within vegetation's reach, and turns up those seeds which were buried below the action of the vegetative powers, and these, in their turn, are served in like manner as were the former.

Between every plowing the fallow ground should be rolled and well harrowed, and let lie till the weeds are just come up, when it should be plowed again. Rolling, harrowing, and plowing, sometimes cross-ways, and at other times length-ways, should thus be continued throughout the summer.

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If the land should happen to be full of such weeds as may hinder the plow and harrows from taking due effect, these are to be raked, or gathered off by women and boys.

On some land under fallow I have seen the weeds suffered to grow to five or six inches in height: This, however, was not for want of knowledge in the cultivator, but for the want of proper strength.

During the time that land is under fallow, every means should be used to cause all the seeds of weeds which may be in it and within reach of the plow to vegetate; for how are the seeds of weeds to be killed if they do not grow? If fallow lands were to be left rough between the different plowings, it is very likely that the seeds of weeds would remain shut up in the dry clods, and by that means there is little doubt but that they would be preserved, and kept from vegetating till after the sowing of the grain.

Among the advantages that attend thoroughly plowing and pulverizing the soil, there are two: The one is, that if there be any poisonous qualities in the soil arising from metals or sulphur, they will be thereby entirely destroyed; the second is that of opening the way for the fibres of the plants to go in quest of their food.

No plants are useless in themselves, but, in respect to the husbandman, those generally called weeds are both useless and hurtful when they come among the corn, for they devour the nourishment designed for the crop. All weeds are hurtful, but some much

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more so than others; some are very pernicious, but easily killed; some less hurtful, but more difficultly rooted out; and some have both qualities together. The hardest to kill are those which grow readily from seed, and have roots, every part of which is qualified for becoming a stout plant in a small time! The worst are couch-grass, bind-weed, colt's-foot, melilot, and some others of the like kind.

Some of these pernicious plants only affect the crop by imbibing its nourishment, and thus starving and lessening its increase; but there are others which add to this mischief, that of spoiling what they leave: These infect the crop with their own nauseous smell, such as melilot, garlic, and some others.

The farmer and gardener find it impossible ever wholly to destroy the weeds in their lands; and the reason seems to be, that several sorts of seeds will lie many years in the ground, and successively grow, some one year, and some another, so that the destroying of the crop entirely for one year does not kill them for succeeding ones. The seeds of the red poppy will lie many years in the ground; some say twenty, in land all that time occupied by saintfoin; and if it be after that plowed for corn, they will grow, and fill the field.

The seeds of these plants will never all come up in one year, because they must have their exact degrees of depth, moisture, and covering: If the seeds want any of these one year, they lie to grow up another. The chief defence the farmer has hitherto found against these enemies is, to endeavour their destruction

tion by a summer fallow : This, if the weather be propitious, does make some havock among them, but it never destroys them entirely ; for they are natives of this country. If the seeds lie so high that the summer's heat parches them up, or so deep that it cannot reach them, they do not germinate, and are, by that means, preserved for another year. Another thing which preserves a great number of them is, their being able to bear the moisture of a whole year without growing : Wild oats, and many other seeds of weeds, are of this kind. If these be gathered when ripe, and sown in the most careful manner, watering them at times, and taking all the care of them that is necessary for the most tender plants, they will not all grow till the second spring after they were sown, and sometimes not till the spring after that : It is, therefore, plain that no art can destroy these by fallowing or other means in one year. The winds and birds may perhaps carry upon the fields the seeds of some sorts of weeds from adjoining hedges, and other uncultivated parts. From repeated experiments I am well persuaded, that supposing a field of land was to be kept in fallow for any length of time, and then let remain unsown and untilled for one year, various sorts of weeds and plants would spring up in it, and, in process of time, its surface would become thickly matted with its own natural spontaneous productions.

Noxious and injurious plants and weeds may, by the industry of man, be kept under subjection ; but they can never be totally rooted out. Just as soon may we exterminate sorrow and grief from among

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mankind, as we can extirpate noxious plants and weeds from the ground which we cultivate.

“Unto the woman he said, I will greatly multiply thy sorrow and thy conception; in sorrow thou shalt bring forth children, and thy desire shall be to thy husband, and he shall rule over thee. And unto Adam he said, Because thou hast hearkened unto the voice of thy wife, and hast eaten of the tree of which I commanded thee, saying, Thou shalt not eat of it, cursed is the ground for thy sake; in sorrow shalt thou eat of it all the days of thy life; thorns and thistles shall it bring forth to thee, and thou shalt eat the herb of the field. In the sweat of thy face shalt thou eat bread till thou return unto the ground; for out of it wast thou taken; for dust thou art, and unto dust shalt thou return.” *Gen. chap. iii.*

We observe many more noxious weeds in grounds which are kept under constant tillage, than we do in meadow grounds. I have observed that in some parts of Scotland where they never fallow, and where the custom is to let some part of their lands rest for three, four, or five years, in that time, by its being constantly pastured, brings it into good heart, and surprisingly cleanses it of noxious weeds; but no sooner is it again plowed up, and sown with grain, than the injurious weeds, which lay dormant, begin to make their appearance. This, I think, is a true indication that the curse which the Almighty pronounced on the ground for man's disobedience still continues to take place.

FENCES.

FENCES.

THE keeping fences and hedges in repair is, in general, an expensive article relative to husbandry, especially in the vicinity of towns where poor people live, and who, in cold weather in winter, are apt to take the dead wood from the fences for firing. Hunters and shooters are also destructive of the fences; they also do hurt by riding through the fields in wet weather.

Gentlemen and farmers cannot pay too much attention to the hedges and fences of their lands; for, without keeping them in good order, they might as well cultivate the open fields.

In fencing, the work should be done in the best and most profitable manner, and which is what is called the *plashing* method. The way to perform it is as follows: The labourers first clear the old hedge of all the dead wood, and brambles, and other irregular growing plants, leaving along the top of the bank the straightest and best growing stems, whether hazel, oak, ash, beech, elm, &c. about five or six to each yard; but if there are any gaps or places thin of live wood, on each side of such places they leave the more.

When this is done, they repair the ditch, and all the earth that arises from it is to be thrown on the bank, and the bank is to be tapered gently, so that it does not fall down, or give way by the winter frosts and rains. When the ditch is finished, the men begin the hedge, and they first lay a thin layer of

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brambles or bushes along on the bank among the stems of the live rods, hanging towards the ditch ; they then observe among the stems left in cutting the hedge such as grow in the line where the new hedge is to run, and cut them off about three feet from the top of the bank, to serve for hedge-stakes in the new hedge. This practice cannot be too much commended ; for these live stakes being immoveable, and never rotting, keep the new hedge steady, so that it cannot fall, nor lean to either side. After this they drive in their dead hedge-stakes in those parts where there is a deficiency of live ones ; in wet grounds they chuse fallows or willows, because these grow. The hedgers then plash down the remainder of the live wood left standing ; they, in general, cut the stick twice, one stroke near the ground, and the other about 8 or 10 inches higher, and just deep enough to slit out a part of the wood between the two, leaving the stem supported by little more than the bark *, or about a quarter of its first size ; it is then laid along the top of the bank, and wove among the hedge-stakes. They are all served thus, and where they are not thick enough to finish the hedge, dead thorns and bushes are wove among them, and then the top of the hedge is eddered with rods in the common manner.

The fence thus made consists of a good ditch and hedge, most parts of which are alive, that is, the

* If the sticks can be wove in without cutting them, they will make the stronger fence, but frequently many of them are too stubborn to be kept down unless half cut.

stakes, and much of the wood which is weaved between them. The importance of having as much as possible of the hedge alive, cannot be too strongly recommended. This management ensures a lasting fence; whereas the hedges that are all made of dead wood, presently rot, and fall into the ditch; and even before they rot, they are frequently pulled to pieces by the poor people for fuel.

The common hawthorn is the best of all trees to plant for a fence; being a tolerably quick grower, lasting a long time, and making a very handsome fence; and it will succeed on almost any soil if it be properly treated and taken care of. After the planting of a hawthorn hedge, it should constantly be kept clear of weeds for six or seven years, or till it has required such strength as to overpower the weeds; and while it is young, care should be taken to keep cattle from it.

When the fence or hedge is about eight or nine years growth, it may be plashed or laid down. This is performed by driving stakes all along the hedge about two feet or thirty inches apart, giving the shoots or branches a cut with a knife or bill half way through, and then weaving them among the stakes, and trimming off the small superfluous branches. After this the hedge will grow thick and strong, and will last for many years, attended with no other expense than that of cutting it down every four or five years to about three or four feet: Where shelter is wanted, it may be allowed to grow higher.

In plashing the hawthorn or quickset hedges, two extremes are to be avoided: These are, the laying it too low, and the laying it too thick. The laying it too low hinders the shoots from making due progress at the bottom, and the laying it too thick is apt to make the sap run all into the shoots, and leaves the plashes without sufficient nourishment: The best way to do it is in the middle mode between the two extremes. Holly is an excellent shrub for a fence, indeed it is the best of all the fence bushes; because it is a hardy evergreen, and will grow in any soil, even on the driest, or among stones and rocks when once it has fairly struck root. It delights most in light dry grounds; but it is a slow grower, and is so uncertain, that the farmers are afraid of waiting for it, or trusting to it; but where it succeeds it makes amends for the delay in its thickness and strength.

Elm, lime, elder, willow, alder, hazel, birch, &c. make good fences when they are planted thick enough, and grow well.

MEADOWS.

THE best grounds for meadow and pasture lands are either low level lands or hanging grounds, where there is a rich deep soil, on a moist, but not a wet bottom. I have often observed, that meadow lands with a wet bottom near rivers, and which are at times overflowed, bring great crops of grass, but it is not of so good a quality as that which is produced from

from good land that is never overflowed, and which lies on a more dry bottom.

To lay down land in meadow there is, in my opinion, no other grafs-seed required but white clover and rib-grafs. These are both abiding grasses, being natives of almost every part of Great Britain : Other grasses which are natural to the soil will come of course.

Before land is laid down in meadow, it should, by tillage and manure, be brought into good heart, and thoroughly cleansed of all noxious weeds ; and if any such weeds as docks, thistles, &c. appear afterwards, they should not be suffered to make any great progress before they are rooted out.

Meadow lands are greatly improved by manures of various sorts, such as chalk, dung, marl, &c. These should be laid on in the month of October or November, in order that the frosts may break and pulverize them, and the rains wash them in among the roots of the grafs. And in some cases where the sward begins to become mossy, it will be advisable to harrow the surface well, ~~and in the~~ spring to sprinkle on it the seeds of white clover and rib-grafs, and then bush-harrow it.

The month of February is a good time to manure meadow land with the dung of pigeons and poultry, as also with foot, wood-ashes, coal-ashes, malt-dust, &c.

In some meadows the ants throw up hills for their habitation and the breeding of their young. They frequently do great mischief to dry pastures, not only

by wasting so much land as they cover; but by hindering the scythe in mowing the grass, and producing a poor hungry food rather pernicious to cattle.

The best way that I know for destroying them, is to cut the surface of each hill into four or five parts from the top, and to dig so deep into them as totally to root out the ant-nests, and to take out as much mould, so that when the turf is laid down again it may lie as low as the level of the rest of the land. The earth that is taken out should be broken small and scattered to a good distance. Some cut off the hills on a level with the ground, and lay them together in a heap, and burn them for manure.

The most proper time for doing this work, is in November or December, and if the places be left open, the rains and frosts of that time of the year will destroy the greatest part of the ants; but in this case care must be taken, that the turfs are turned into the holes early enough in the spring; otherwise they will be less fertile in grass than the other places. After such a process the field should be sprinkled here and there with grass-seeds in the spring, then bush-harrowed and rolled.

The scarifying of grass lands is the practice of some ingenious gentlemen. It consists of cutting the turf or surface with a plowing harrow, so that the surface may be all cut or torn: If there is any fault in the nature of turf or sward, which hinders the ground from yielding crops proportioned to its fertility, it is sometimes owing to the surface being so bound by the matting of the roots, which are so netted and wove through and upon

upon it, as in some degree to exclude the influence of the atmosphere. Rolling is a means to increase this evil: The more the soil is compressed, in such cases, the less pasture will the roots have; but let it be well scarified, and it will destroy some of the roots, and give the others loose earth to run in; and if manure is to be laid on it, the argument is still stronger, for after the surface is scarified, the manure being spread, it will be enabled to sink into the surface among the roots of the grass. For such meadow lands, coal-ashes, lime, chalk, and scrapings of roads, are good manure.

There is to be found in most counties, a sort of meadow land, which is very inclinable to moss, which hurts the grass, and impoverishes the land; such land should be fed down bare with sheep; and all sorts of cattle should have leave to run upon it in winter*. It should likewise be well harrowed in the spring with sharp-teethed harrows, and sown with white clover, &c. Watering meadows, where it is practicable, is a work of no small importance, for it makes the grass grow early in the spring, which is particularly useful for the nourishment of ewes and lambs. Meadows that are watered and eaten quite bare so late as the beginning of May, will, after that, produce an excellent crop of hay.

Wherever meadow or pasture lands are situated so that water can be brought on them from the higher

* On meadow land which is inclinable to moss, it will be found a good method to lay turneps, and there let the sheep and cows eat them.

grounds,

grounds, whether by means of rivers, ditches, or springs, it should not be neglected, though some expense were required to accomplish it.

Overflowing or flooding of meadows is one of the best improvements: Where it can be effected, it begets the grass called by some the *flots fescue*, or *marsh-bent*, which is a very sweet grass. This is the grass that swims on the tops of ponds, springs up where water runs, and which horses and cows are very fond of.

I have frequently observed, upon hilly and heath lands where springs are often to be met with, that the earth which receives the water is full of verdure at a very early season. And wherever the water of springs runs, if there be heath in its way, it destroys the heath, and causes the grass to grow instead thereof.

The method which I take to water meadows is the following: I make a ditch the whole way across the highest side of the field, where the water is first to enter; this ditch I have made just as large as to let the body of water run in it without running upon the surface of the field, then at every seven or eight feet distance, or thereabouts, as I find necessary, I make stoppages or checks with turf or earth; these are to throw the water equally all over the field, and must be made larger or smaller according to the discretion and ingenuity of the person who has the direction of the operation.

If the field designed to be watered lie on two or more declivities, it will be necessary to make two or
more

more ditches at the upper side of each declivity; which will more effectually enable the water to overflow every part of the field. In case the water lodge in swamps or flat places, small drains or ditches must be cut through them to carry the water off, because it should only run over the grass, but not remain on it; for if it was permitted to stand on it, it would sour the ground, and breed rough marshy ill-tasted grasses, such perhaps as flugs and water-trefoil.

The flooding or watering of dry lands is exactly the reverse of draining wet lands; for in the one the water is enticed, by means of under-ditches or channels, to drain or run from the field into one or more deep ditches; and in the other the water is enticed to run over the whole field but of one or more large channels assisted by smaller ones. Great improvements still remain to be made both in the watering of meadows, and draining of lands; and it requires men of some practice and ingenuity to oversee and conduct these improvements in such a manner as they may prove advantageous to those who are at the expense of them. Flooding meadows is to be done in the winter months; it should be turned off by the middle of March, but some continue it on to a later season.

DRAINING.

THE draining of wet land is the first improvement that it can receive with any tolerable degree of advantage; for until land be laid dry, it is of little use

use to bestow manure upon it. In several parts of the kingdom where plowed land is naturally wet, different remedies have been attempted. In some parts the land is thrown up into ridges, and raised in the middle to at least three feet above the level. This method seems to be attended with some loss, and no small inconvenience.

Wet land should be plowed into small ridges, and in such a manner as to give the furrows a free discharge; this takes off the surface water, and the furrows in general will grow as good corn as the ridges.

The Essex gentlemen and farmers are reckoned the most expert drainers of wet land. The method they follow is, to make a principal drain seven or eight inches deeper than the ordinary drains for the latter to empty themselves into.

There is no general rule with respect to the proportion of ground which these main drains will serve; sometimes one is sufficient for eight or ten acres, but in such case the ground must lie all one way, and the soil must be stiff in its nature. But when the descent lies different ways, there must be one principal drain or ditch to every slope. When there is a good discharge into a ditch, which has also a good outfall, it is preferable to a main or principal drain; because any obstructions which may happen are easier remedied; for when an ordinary drain is choked up, the place is readily found out, but when many drains are connected together, it is frequently tedious to find out the defect,

and

and even sometimes moles may occasion a stoppage by their work.

To open the principal drain, the method is, to plow four deep furrows, throwing two each way, the two inside furrows being plowed deeper than the outside ones. Between these furrows the earth is sunk a full spit deep with a common spade, and afterwards another spit with a land-ditching spade, called a griping spade, and, last of all, a scoop is made use of to rake out all the loose earth. This drain, when finished, is about thirty inches deep. The common drains are begun and completed like the principal ones; but the spit with the common spade is omitted, and, therefore, they are not above twenty or twenty-two inches deep, three inches wide at bottom, and four at the top of the grip. The drain is filled up as high as the top of the spade work, with brush-wood at the bottom, and a piece of wood about the bigness of a man's leg on the top, and a little straw is shaken over that, and the remainder of the drain is filled up with earth. The greater the proportion of wood, and the harder the earth is pressed in, the longer will be the duration of the work. The wood should be such as runs tolerably free in its branches; elm, hazel, alder, and willow, will do very well*.

The expence of this improvement varies according to the soil. Upon a gravelly soil, or upon a mixture of loam and gravel, it is said it will last from six to twelve years; and upon a clayey or stiff tenacious soil, it will last twenty. But even in the former case

* Heath, broom, furze, &c. will also do.

it

it is evident that it will reimburse the expense, as it is done in general by the tenants in that country, and it is said, even by tenants at will. In the draining of lands, one universal principle should be attended to, which is, to get a good outfall or discharge, and to draw the drains obliquely, that is, anglewise across the descent of the ground, not right down with, nor right across the fall. The advantage is evident; for if a spring rises in any part of the ground, it cannot in this case have far to run before it finds the way of passing into the drain; but if the drains were drawn straight down with the descent, the wet might ooze down right parallel with the drain, for some considerable length, before it could pass into it, though it were only at the distance of a few yards from it; and on the other hand, if the drains were drawn across the descent upon right angles, and a dead level, they would of course remain full of water for want of free liberty to discharge itself. A little fall must be allowed, but the less the fall, if it carry the water clear off, the longer will the drains endure; because they will not so soon fill up by the washing in of the soil, as if they had a great fall. This method seems to be the best upon springy land. If the soil is very wet, it will be necessary to make the drains pretty near each other, for instance, about a rod, a rod and a half, or two rods asunder: Where stones, bricks, brick-bats, or rough chalk can be had, they will last longer than bushes. Drains covered with stones or bricks are expensive; but then, if they be well executed, they are of long

long duration. In very wet lands, especially meadows, it will be advisable to leave all the principal drains open, which will, in some cases, serve for fences, as well as for laying the land dry.

ON THE CULTURE OF WHEAT.

THE botanical name of wheat is *tritium*, and it is a genus of the triandria class. Its characters are these: It has an oval chaffy empalement with two valves, which inclose two, or three flowers; the petals have a double valve as large as the empalement; the outer valve is bellied and acute-pointed, the inner is plain; the flowers have three hairy-like stamina, terminated by oblong forked summits, and a top-shaped germen supporting two hairy reflexed styles crowned by feathered stigmas; the germen afterwards becomes an oblong oval seed obtuse at both ends, convex at one side, and channelled at the other, warped up in the petal of the flower. Linneus enumerates eleven species, Miller four, and Aiton twelve.

To determine where wheat grows naturally is not very easy, but it has generally been supposed that Africa is its native country; because in the earliest accounts of wheat, mention is made of its being transported from thence to other countries, and it is said that Sicily was the first country in Europe where this grain was cultivated.

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It has been very justly observed by the ancients as well as moderns, that wheat will grow in almost any part of the world; and that as it is the plant most necessary to mankind, so it is the most general and most useful. It grows well not only in the temperate climates, but in the very warm and very cold ones, and when sown in places where it never grew spontaneously, it succeeds as well as where it has always been common.

The success of the crops of wheat in America clearly proves this, and in Peru and Chili in particular (where, though those countries were very well inhabited, it never was known till the Europeans brought it in), it produces as large crops as in any part of Europe.

Wheat succeeds best, in general, upon strong loamy soils, especially if they have been well drained, so that the corn lies dry; but as some sorts of grain prosper better in some soils than in others, particular attention should be had to the nature of the soil in the choice of the grain.

The time for sowing of wheat is in the months of September, October, and November; which of these months is the best for that purpose depends much on climate and soil. In the downs of Hampshire, Wiltshire, and Dorsetshire, some farmers begin to sow their wheat in August, and in several parts of England September is reckoned the best month; in some parts of Surrey and Kent the latter part of October and beginning of November is preferable: But in whichever of these months wheat is sown, it should

should be done when the earth is in a moderately moist state. Some plow the land for wheat in August or September, and let it lie till rains come, and then sow it.

There are several sorts of wheat which in different countries go under different names. The white wheat, the red lammas, the yellow lammas, the pirky, and the red Kentish, are by some reckoned among the best sorts.

The usual quantity of seed sown on an acre of land is from two to three bushels, but some writers have recommended a much less quantity. Early sowings require less seeds than late ones; because the plants then rise better, and acquire strength to resist the winter's cold. More seed should always be allowed for poor lands than for those that are rich, because a greater number of plants will perish in the former; rich lands, sown early, require the least seeds of all.

Another circumstance which should be attended to in sowing wheat is, that the estimate of seed be formed not from the capacity of any particular measure, but from the number of grains which that measure will contain; because the grains of some sorts of wheat are much larger than those of others, though perhaps equally good. It is natural to suppose that a large-grained wheat will produce larger and finer plants than a small-grained one; but experiments have proved that the smallest-grained wheat produces as large plants as the largest. In the choice of seeds

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for sowing, particular attention should be paid to the land upon which they grew; for if it is light land, the wheat which grew upon strong land is the best, and if it is strong land, the seeds which grew upon light land are the best.

It is acknowledged and proved by many experienced farmers that the change of seed gives great improvement to a crop of grain, especially to a crop of wheat. The most general practice in sowing wheat is by the broad-cast, after which the ground is harrowed several times till the seed be well buried; some sow their wheat, and plow it in. Drill-sowing of wheat, as well as of all other grain, has by some been strongly recommended, but it has so many difficulties to overcome, that I am apprehensive it will never be brought into general use*.

Wheat

* The Rev. James Coope has invented a drill machine, which, for its curiosity and usefulness, appears to excel all others of the same kind yet invented, and the inventor, like all the rest of us, is not backward in setting forth its utility. He says, there is every reason to believe that the drill system will become general; and whenever that period arrives, he can, with the greatest propriety, and without fear of running into error, pronounce that the rental of this island, so far as relates to the cultivation in tillage, will be more than doubled. These and such-like assertions are, undoubtedly, strong incitements for gentlemen proprietors to endeavour to have the drill husbandry adopted on their estates; for it appears too evidently that several proprietors of land aim more at the increasing of their rents, than they do at the cultivation of the soil; but in the end they or their progeny will perhaps find their mistake. When tenants are over-rented, it is, doubtless, a great discour-

Wheat by some is scarce ever sown but upon summer fallow, or clover ley; but, from experience, I can say, that it will grow very well after any kind of crop, provided, however, that the land be thoroughly cleaned, and properly manured: I have sown it with good success after a crop of oats. The method which I took was this: After the crop of oats was carried away, I had the land plowed three times, and well broken with the harrows and roller, the weeds clean picked off, and the land well dunged; but this method cannot be followed by every cultivator, nor will it answer in every season, or in every part of the country.

I have frequently known wheat sown the same year after two crops of red clover; but I do not think that such a method is good husbandry. In my opinion the best way to make sure of a good crop of wheat after clover is to plow up the land immediately after the first crop is got off, and either let it lie till the time of sowing, or give it three plowings. Wheat is generally sown after meliorating crops, such as tares, pease, and beans; and although I have never experienced it, yet I am persuaded it would succeed very well after a crop of potatoes: But whatever crop wheat follows, the great object should be

discouragement to them; for when that happens, how can they cultivate the land with spirit or alacrity? A man, embarrassed in his circumstances, can ill carry on business with any great degree of success. The over-renting of land is often not so much occasioned by the proprietors themselves, as by those whom they employ to value and lease out their land.

to have the land well cleaned, and properly manured.

Water-furrowing is of importance in the culture of wheat : This work should be well performed on all lands, except upon those that are all the winter through perfectly dry. The water-furrows should be plowed as soon as the field is finished sowing and harrowing, and then a spit should be dug out from the bottom of them, and scattered about on the surface of the land, and the loose mould shovelled out. The openings of all the furrows should likewise be cleared, so that the water may have an easy fall out of every furrow into the water ones. The number of these must ever depend on the variations of the surface, the only general rule being to make them so numerous, that no water can stand on the land in the wettest weather.

The disease called smut* is frequently very prejudicial to wheat. This disease seems to be incurable, but with good conduct it may be prevented ; and I can, from experience, recommend the following as an excellent preventative :

Provide a tub or two, or more, large enough to hold more than the quantity of wheat intended to be wetted at one time, then put water into the tubs, and dissolve in it as much salt as will cause a new-laid egg to swim ; when this is done, take the wheat,

* Besides smut there are other diseases which affect wheat. The slug and wire-worm are in some seasons and on some lands very destructive of wheat, especially on clover-leys of one plowing.

and

and put it among the salt water by little and little at a time, stirring it well with a stick to enable every thing that is light among it to swim on the surface, and whatever comes to the surface of the water is to be carefully skimmed off. Let the wheat remain about twelve hours in the water, and then drain the water off through a cock with a strainer, and put the water into other tubs in reserve for the next wetting. The water being thus drained off, the wheat is to be laid out on a barn floor, or any other clean place, and mixed well with slaked good lime, till it become so dry as that it can be sown with freedom.

Although wheat is generally sown the same day on which it is limed, yet, if need be, it may lie several days after without taking any hurt; but, in that case, it should be spread so thin as to prevent it from heating, and turned now and then in order to dry it. If this method is exactly followed, the land properly prepared, and good seed procured, the industrious cultivator may, through the blessing of God, expect a plentiful harvest.

Smut may be caused by sowing one sort of seed too often in the same soil, by infectious blighting winds, by the land not being properly prepared, by infected seed, and by sowing weak unbrined seed.

Smut in wheat may be known by the infected grains being filled with a black stinking powder.

The steeping of seeds in supposed prolific liquors is a practice that has occasionally prevailed, and it is not of modern invention. The Romans, who were good

husbandmen, have left us several receipts for steeping of grain, in order to increase the powers of vegetation. In England, France, Italy, and in all countries where agriculture has been attended to, a variety of liquors have been recommended for this purpose. The practice is founded on a presumption that, by filling the vessels of the grain with nourishing liquors, the germ with its roots would be invigorated. On this subject Dr. Hunter observes, that all his experiments demonstrate that steeps have no inherent virtue; having sown more than once the same seed steeped and unsteeped, all other circumstances being alike, he never found the least difference in the growth of the crop. When indeed the light seeds are skimmed off, as in the operation of brining, the crop will be improved, and diseases prevented; but these advantages proceed from the goodness of the grain sown, and not from any prolific virtue of the steep: In this opinion many rational farmers, being convinced by experience, concur. Duhamel and others speak in the strongest terms against steeping, so far as it supposes an impregnation of vegetative particles. Dr. Hunter, having sprouted all kinds of grain in a variety of steeps, assures the farmer that the radicle and germ never appeared so vigorous and healthy as when sprouted by elementary water; whence it appears that the seed wants no assistance.

Upon the whole he concludes, that as no invigorating or fructifying liquor, however pompously introduced, has ever stood the test of fair and correct experiment,

experiment, it may be laid down as an established truth, that plump seeds, clear of weeds, and land well prepared to receive it, will not disappoint the expectations of the farmer, and upon these he should rely for the goodness of his crop.

Some farmers feed off their crops of wheat in the spring with sheep; but I cannot recommend the practice, although upon some lands, and in some seasons, it is found serviceable.

The rolling of wheat in the spring on light lands, as practised by some, is beneficial, especially in dry seasons; because it prevents the moisture from evaporating so quickly from about the roots of the plants, as it would do if the earth was to be left in a loose state. It is also the means of destroying some sorts of insects which prove detrimental to the wheat, and it is a means to enable the corn to stand steady against the winds and stormy weather.

In preparing the land for wheat, I frequently lay the dung on in the months of June or July, and plow it in immediately, to prevent its goodness from being evaporated: This method seems to be a good one; for by laying the dung on the land so long before the time of sowing, it is well mixed with the earth, and their particles are thoroughly incorporated. In this mode of procedure there is also another advantage; for it gives the seeds of weeds, which happen to be among the dung, an opportunity of vegetating before the last plowing, by which means they are effectually destroyed.

If, in the spring, pernicious weeds appear among the wheat, it should either be hoed or hand-weeded:

This ought to be done before the wheat becomes too high, for, in that case, the weeding or hoeing would do more harm than good. But whether the method of hoeing or hand-weeding is practised, care should be taken that the weeds be totally destroyed; for if they are only cut off or broken near the ground, instead of destroying them, it will give them new vigour, and they will shoot up with many heads instead of one.

The ripening of wheat may be known by the change of colour in the straw and ears from a dark green to a reddish or brownish white colour. When the corns of wheat begin to get hard, it is time to begin to reap; for if wheat be let stand unreaped till it be dead ripe, it will not have that fine lively bright colour as when reaped earlier: Besides, if wheat be let stand uncut till it is too ripe, it will be apt to shed out at reaping, binding, and carrying. Wheat, if possible, should never be housed or stacked but when it is perfectly hard in the grain and dry in the straw.

I shall here observe, that, with regard to the different methods practised in the manuring, dunging, dressing, fallowing, and plowing, of the ground for obtaining a full crop of wheat, they are not worth disputing about. The great matters of fact appear to me to be these: Whether the mode of culture practised or recommended be not too expensive for the reimbursement of the cultivator; whether the ground be in good heart at the time of sowing, and whether the seeds are put into the land properly and in due season.

It

It is best, if possible, to sow when the land is neither too dry nor too wet, but at any rate the right seed-time must not be passed over without depositing the seeds; so that the industrious and laborious cultivator is often under the necessity to sow sometimes when the land is too dry, and at other times when it is too wet. I once sowed wheat in land too dry for any great number of the seeds to vegetate, and after sowing I rolled it, and when rain came, the seeds that lay almost inactive for want of moisture, vegetated, came up freely, and a plentiful crop ensued.

When land is too wet, and the season likely to pass over before it become sufficiently dry, a good method, and which I have sometimes practised, is to procure a pole as long as the breadth of each land, chain the harrows to this pole regularly, fix the horses to each end of it, and let them walk a-breast in the furrows opposite one another. Where the lands are the breadth of three harrows, four horses will be requisite, but if the lands are only the width of two harrows, two horses will be sufficient.

ON THE CULTURE OF BARLEY.

BARLEY in botany is called *hordeum*. Its characters are these: It hath a thick spike; the calyx, husk, awn, and flower, are like those of wheat or rye, but the awns are rough, the seed is swelling in the middle; and, for the most part, ends in a sharp point, to which the husks are closely united.

There

There are several sorts of barley : First, the common long-eared ; second, the winter or square barley, which, in Scotland, is called bear, and by some big ; third, sprat barley ; fourth, rath-ripe barley. The principal use of barley in England is for making beer, in order to which it is first made into malt ; it is also used for feeding poultry and swine. In Scotland the poor people make bread of it, and it is also used there for distilling.

Barley is a more difficult grain to get plentiful crops of than wheat ; because it disagrees with several sorts of soils. The best soil for the culture of barley is a rich sandy loam, which lies on a dry foundation. In the south of England the best time for sowing barley, if the land can be brought into proper tillage, is from the middle of March to the middle of April.

Chalky, sandy, and gravelly soils, are the best of all others for producing a fine white thin-skinned barley.

Barley is sown in succession after various crops, such as wheat, pease, beans, oats, &c. and it succeeds very well after crops of potatoes and turneps.

The principal point in the cultivation of barley is to sow it upon suitable land, and to have the soil brought into such a state, that no other spring tillage may be wanted but the seed earth. Wherever this practice can be followed, a plentiful crop may be expected.

In the year 1787, a field containing eight acres, which produced a crop of oats the preceding year, I
had

had plowed in the winter ; after which it lay unstirred till the month of May, when I cross-plowed it, and after that it was harrowed, rolled, and plowed, alternately till the latter end of June. Then it was well dunged, and sown with turneps, which came up well, and in the course of the season they were twice hoed, and cleared of weeds.

This crop of turneps was partly fed off with sheep, and the land in the month of December being perfectly cleared of turneps, was then plowed, and remained in that state till about the latter end of March, at which time it was harrowed, plowed, and sown broad-cast, with four bushels of barley, nine gallon measure, to each acre. This mode of culture was the means of producing an excellent crop of barley, and I think may be deemed good husbandry.

The above-mentioned field lies on a gentle declivity to the north ; the upper half of it is a strong clayey loam, rather inclinable to a wet springy bottom ; and the lower half of it a sandy light soil on a sandy bottom.

In the year 1785 I sowed a field of about eighteen acres, being a strong clayey wet-bottomed loam, four acres of it with pease, and the rest with black oats, both parts of which produced good crops. In October following this field was once plowed, and in December I had it rib-plowed * crosswise, and water-fur-

* Rib-plowing, or ribbing, is performed by making furrows about two feet distant from each other ; one half of the surface is left untouched by the plow, and the other half, which the plow turns up in making the furrows, is thrown on the top of what remains fast.

rowed.

sowed. In this state I suffered it to remain until the month of May, when being dry, I had it harrowed with heavy harrows, and rolled alternately, till its surface became fine and smooth. When this was effected, I sowed four bushels of barley on each acre, together with a sufficiency of red and white clover and rib-grass seeds; these were harrowed in with light harrows, and the land immediately rolled. And almost as soon as this process was gone through, providentially a fine warm shower of rain fell, which enabled the barley and grass-seeds to vegetate quickly and regularly; and the weather, being warm, and the seeds good, in the course of a very few days the surface of the field exhibited a verdant beautiful appearance.

The consequence of this uncommon mode of culture was, that the field produced upwards of sixty quarters, nine gallon measure, of good barley, and the succeeding year it produced a very good crop of oats.

The crop of barley was as good on that part of the field which produced oats the preceding year, as it was on that part which produced pease. Thus the foresaid field, by a simple, and, in the opinion of some, an apparently bad method of agriculture, produced such crops for three years, as perhaps the ingenuity of man could not have bettered for profitableness.

* Had not this mode of culture been adopted, the field must necessarily have lain in summer fallow.

Having

Having mowed and raked off the wheat stubble of seven acres of land, of a strong stiff clayey nature; in December 1792, I had it well plowed and water-furrowed; in which state it remained till about the middle of March 1793; The weather then proving fine and dry, I sowed it with barley, four bushels on each acre. These seven acres produced as good a crop of barley * as any that I observed in the neighbourhood, and a much better one than land of a more suitable nature for barley; and which, under my management, was plowed several times and sown in due season.

On the shallow chalky lands of Hampshire, I have frequently seen the farmers sow their barley without plowing on the surface of their turnep land, and plow it in, and harrow and roll it afterwards.

All the sorts of barley are sown in the spring of the year in dry weather. In some very light land it is sown early in March, but in strong clayey soils it is not sown till April, and sometimes not until the beginning of May; but when it is sown so late, if the season do not prove favourable, it is very late in

* I am now writing on the twentieth day of February 1794, and in the preceding week I had a part of the said barley winnowed, and it is as fine a sample as can be shown in the county, and far better grain than that which I cultivated in the usual way. I therefore mean to follow this mode of practice on tenacious stiff soils under my management, when it is necessary to interweave barley in the rotation of crops. The said field was sown at the same time when the barley was sown with red clover, and a small quantity of rye-grass, which at this time has as good an appearance for a plentiful crop as any of the like kinds which I have seen this season in this neighbourhood.

the autumn before it is fit to mow, unless it be the rath-ripe sort, which is often ripe in about ten weeks after the time of sowing.

The ground for barley should be plowed about the beginning of October, in a dry time, laying it in small ridges, that the frost may make it mellow, which will improve the land greatly; and if it can be plowed in January or beginning of February, it will break and prepare the ground the better. In March it should be plowed again, and laid even where it is not very wet; but in strong wet land the ground should be laid in round lands, and the furrows made deep to receive the wet: When this is finished, the common method is, to sow the barley-seed with a broad-cast at two sowings, the first being harrowed once, the second is harrowed until the seed be well buried. The common allowance of seed is four bushels to an acre; but those who recommend the drill system, affirm that two bushels are sufficient. After the barley is sown and harrowed in, if the ground is dry, it should be rolled, to break the clods, and lay the earth smooth; but if the ground be not rolled immediately after sowing, it should be done when the barley has been up three weeks or a month. Rolling renders the crop easier to mow, and also causes the earth to lie closer to the roots of the plants, which is of great service to the corn in dry weather.

Where barley is sown upon new-broken-up land, the usual method is to plow up the land in March, and let it lie fallow until June, at which time it is plowed again, and sown with turneps, which are
eaten

eaten by sheep in winter, by whose dung the land is greatly improved; and then, in March following, the ground is plowed again and sown with barley.

When barley is ripe the straw turns yellow, and its ears hang down.

In Scotland, and in the north of England, they always reap their barley, and make it up into sheaves, as is practised in the south of England, and all over the kingdom for wheat; but in many parts of England the practice is to mow, or cut down barley with the scythe, and to let it lie abroad in the field till it be fit for carrying. It is then loaded up in the same manner as hay is, and either built up in a rick, or made into a mow in the barn. The latter method, where there is room, is by far the most preferable, both on account of saving the grain, and of avoiding labour.

If between the cutting and carrying of barley there happen to fall a good shower of rain, it is reckoned that thereby the profit of the farmer will be increased, and that of the maltster diminished. However, let it be observed, that barley, as well as all other sorts of grain, should, if possible, be carted, stacked, or housed, when they are perfectly dry.

Barley is sure to be damaged, particularly for malt or seed, if it be carted when is too damp or moist.

Barley straw, if well harvested, is no bad fodder; but when badly harvested it is good for nothing but litter, and manure when rotten.

In

In the northern parts of Scotland the square-eared barley, commonly called bear, or big, is generally cultivated. The mode of culture practised there is the following:—

After two, but more frequently after three, and sometimes after four, crops of oats, in the winter the land is rib-plowed, and in the month of May it is broken to pieces with the harrows, and then dunged, plowed, and sown. Although the barley seed time, in that part of the country, is always later than the oat seed time, yet the barley ripens before the oats. Some farmers manure their land before they rib-plow it.

ON THE CULTURE OF OATS.

THE oat, *avena* in botany, is a genus of the triandria digynia class. Its characters are these:—The flowers are collected in a loose panicle, and have a bivalvar empalement swelling in the middle; the petal of the flower is bivalve, having a spiral beard, twisting, jointed, and reflected; there are two oval nectariums sitting upon the upper side of the germen, which have three slender stamina; the germen afterwards becomes an oblong swelling seed, having a longitudinal furrow, and closely shut up in the clover, or chaff. Linneus enumerates sixteen species.

There are several varieties of oats cultivated in England, but I shall mention only three, that is, the white,

white, the black, and the brown, or red. The white oat is the most common about London; the black is more cultivated in the northern parts of England, and is esteemed a very hearty food for horses; but the first makes the whitest meal, and is chiefly cultivated where the inhabitants make it their principal sustenance.

This grain is of great improvement to many estates in the North of England, Scotland, and Wales; for no soil is too rich or too poor, too hot or too cold, but what oats will grow in it. And in wet harvests, when other grain is spoiled, this will receive less damage, because the straw and husks being of a more dry nature than those of most other corn, they are not so liable to heat, or become mouldy, in the mow, rick, or stack.

If the weather prove favourable, oats may be sown any time from the middle of February to the middle of April; but the month of March is reckoned the best season. The black oat is the most hardy, and therefore may be sown the earliest, and it will grow better on poor land than white oats.

The quantity of seed generally sown on an acre of land is four bushels, but some recommend the sowing of five.

Oats are often sown on land which has the former year produced wheat or barley. The method is to plow the land in January, February, or March, and some do it in December*. The seed is sown broadcast,

* If the land is clean, and in good heart, I prefer the month of December for plowing for oats, because the surface being exposed

cast, and the land well harrowed; and if it lie wet it should be water-furrowed, as recommended for wheat.

Some think this once plowing for oats not the best method; they therefore recommend that the land should be plowed in autumn, and again just before the oats are sown. However, the chief thing to be observed in the cultivation of oats is to endeavour to have the ground well prepared by cleaning and manuring, and to sow and harrow in the seeds in a kindly season.

In the northern parts of England, and in Scotland, they reap their oats and bind them up into sheaves; but in the southern parts of England they are cut down with scythes, and harvested without binding.

Oats should be rolled in the month of April, or beginning of May; and it should be done when the land is dry.

ON THE CULTURE OF PEASE.

THE pea in botany is called *pisum*, and is a genus of the *diadelphia decandria*. Its characters are these: The flower hath an empalement cut into five points, the two upper being broadest; it hath four petals, and is of the butterfly kind. The standard is broad, heart-shaped, reflexed, and indented, ending in a point; the two wings are shorter, roundish, and close posed during the winter to the air, the rains, and the frosts, it becomes pulverized and mellow,

together;

together; the keel is compressed, half-moon shaped, and shorter than the wings; it hath ten stamina in two bodies, the upper single one is plain and awl-shaped, the other nine are cylindrical, below the middle, and awl-shaped above, and cut: These are joined together. It has an oblong, compressed germen, with a triangular style; the germen afterward becomes a large long taper pod, terminated by a sharp rising point, opening with two valves, having one row of roundish seeds.

There are several sorts of pease cultivated in the gardens all over the kingdom: The pea is a native of the south of Europe, and some of the inferior sorts grow natural in the south of England. The common white field pea succeeds best in a light, sandy, loose, rich soil. The time of sowing the seeds is in the month of March, or beginning of April; the usual method of sowing these pease is with a broadcast, and by harrowing them in; but if they are sown in drills, a less quantity of seed will do for an acre, and the ground will be more easily hoed to destroy the weeds, and the pease may be earthed up*, which will greatly improve them.

The horn grey, or hog-pease, thrive best on a loamy strong land; from three to four bushels of them are generally sown on an acre, and the time of sowing is from the middle of February to the middle of March, but any time in the month of March will do.

* Earthing up of pease is to draw the mould in each side of the row gently to the roots of the plants.

I have sometimes sown them in April on rich land, and have had good success.

Pease are generally sown on land which the former year produced wheat, barley, or oats. Some plow the land in autumn, and again just before sowing. If the land in which pease are sown be of a light dry nature, rolling will be serviceable; if weeds arise among the plants, they should be cut up with hoes, or hand-weeded; but the former is the most proper method.

In Surrey, the general and most common method is to sow hog-pease by the broad-cast. In April or beginning of May, or when the plants are about two, three, or four inches high, they are hoed after the same manner as turneps are, but are left thicker. The price per acre varies according to the texture of the soil and quantity of weeds.

ON THE CULTURE OF BEANS.

THE bean in botany is called faba. Linneus comprehends this genus of plants under vicia. The characters are these: The flower is of the butterfly kind; the standard is large, oval, and indented at the end; it hath two oblong erect wings, which inclose the keel, being much longer; the keel is short, swelling, and closely covers the parts of generation; the nine stamina are in three parts, and one stands separate; at the bottom is situated an oblong, compressed germen, which afterwards becomes a long compressed leathery pod, having one cell filled with flat kidney-

kidney-shaped seeds. There are several sorts of beans planted in almost every garden in the kingdom, the culture of which is well known to every gardener.

The horse-bean is almost the only kind which is propagated by help of the plow. The sort of soil which is most proper for its culture, is a strong moist clayey loam, and which is very proper for wheat; therefore, if a crop of beans is judiciously sown and managed properly, it will be the means of preparing the land for the reception of the wheat-seed. Beans may be sown on land which produced oats or barley the former season, and if the ground be not in good heart, it will be of service to manure it before plowing, by which means it will not require to be dunged for the wheat after bean harvest; therefore, this method will be found a beneficial one, and that for two reasons: First, it will promote the growth of the bean crop; and secondly, it will enable the cultivator to get his wheat sown on the bean land in due season*.

The best time to plow the land for beans is the month of December, and the season for sowing is February, or early in the month of March. The quantity of seed generally sown on an acre, is from two to three bushels. The common method of sowing them is by the broad-cast, and afterwards they are

* The horse-bean is a late crop, so that after they are harvested, the land seldom can be more than once plowed before the wheat-sowing season. Those, therefore, who design to sow wheat after a bean crop, should take care to keep the ground clear of weeds during the summer.

harrowed in; but the best way of sowing beans seems to be the drill husbandry, for then the crop is more easily hoed and kept clear of weeds. Nevertheless, whichever of these methods is practised, care should be taken to keep the land properly hoed, so that the weeds do not overpower or retard the growth of the beans. In harvest, when the beans are cut down, they should be tied into sheaves, and set up in shocks to dry. The agriculturist who has it in his power, should pay particular attention to the culture of a crop of beans, for by this means he may be able to substitute in some cases a crop of them instead of fallow. Those who sow beans by the broad-cast, in general hoe them in the same way as they do pease. I have known some farmers turn in sheep among their beans to eat the weeds *. This method may be a good one, but I think hoeing is by far the most preferable.

ON THE CULTURE OF TARES.

THE tare or vetch, *vicia* in botany, is a genus of the *diadelphia decandria* class. Its characters are these: The flower has an erect tubulous empalement of one leaf, cut into five equal parts at the brim; the petal is of the butterfly kind, the standard oval, broad at the tail, indented at the point, and the borders are reflexed; the two wings are almost heart-shaped, and shorter than the standard; the keel is

* Sheep will not eat beans, unless they are forced by hunger.

shorter

shorter than the wings; the tail is oblong, and divided into two parts; it has ten stamina, nine joined, and one separated, terminated by erect summits with four furrows, and a linear, compressed, long germen supporting a slender style, crowned by an oblong stigma, which is bearded on the under-side; the germen afterward turns to a long pod, with one cell opening with two valves, ending with an acute point, and containing several roundish seeds.

Of this plant there are many species, but those which are commonly sown by farmers have a blackish seed, and go under the name of the winter and summer tares*.

The tare is an exceedingly useful vegetable, both for the feeding of cattle, and for the improvement of land; when green, it is excellent fodder for horses, cows, swine, and sheep.

The times or seasons for sowing of tares, are in the autumn and in the spring, and those sown in the autumn may be fed or mowed off by the middle of June, and then a crop of turneps sown, which may be fed off by the latter end of October; the land plowed and sown with wheat. So that by this mode of management, from one piece of land may be obtained in one year two crops for the nourishment of beasts, and the land well prepared for the production of a crop for the subsistence of mankind.

* I have never been able to distinguish the difference between what are commonly called winter and summer tares.

The tare is a very hardy vegetable, the severest frost we have does it little or no injury, and although it will grow well in the most chalky and sandy soils, yet it delights in a fertile rich land, and loves a plentiful share of vegetative nourishment from the clouds.

The quantity of seed requisite for sowing an acre of land, is about three bushels; frequently four, because of the pigeons, for they are great lovers of tares, and tares are excellent food for them.

The method which I practise in the cultivation of tares is as follows:

In general I sow them on land which had been cropped the preceding year with oats or barley; and if the land is not in pretty good heart, I endeavour to manure it. With every bushel of seed I mix nearly half a peck of rye, and I sow the seeds broadcast, harrow them in, and then if the land is dry it is pressed down with the roller.

With regard to the time of sowing the seeds, I in general sow at five different times: The first in September, the second in October, the third in February, the fourth in March, and the fifth in April. By this means, if the season prove favourable, a constant supply of green fodder is obtained for about the space of three months. Some people sow tares, and when they are grown, plow them into the ground to manure it. This is a piece of husbandry which I conceive is not very profitable; therefore I would by no means recommend the practice. A better method is to feed them off with sheep.

When

When tares are cultivated for their seeds, they should be cut soon after the pods change brown, and when they are dry, they should be immediately stacked, or housed; for if they are suffered to lie out in the field to receive rain, and there come a hot day or two after it, many of the pods will burst and cast out the seeds. When they are well harvested, and the seeds thrashed out, the haulm is esteemed very good for cattle; and some have recommended the seeds for horses, and affirm that they are as proper for these animals as beans; but be that as it may, I know they are excellent food for pigeons.

For the last ten years, tares, as far as I know, have at Croydon market not been sold for less than five shillings per bushel, and sometimes their price has been as high as ten shillings the bushel: Therefore, though they may be excellent food for horses, yet there are but few that will chuse to feed their horses with such expensive provender.

ON THE CULTURE OF THE TURNEP.

IN botany the turnep is called rapa. Its characters are these: The empalement of the flower is three-leaved, coloured, and erect; the flower hath four plain spreading petals, which are narrowed at their base and entire; it has four oval honey glands situated between the stamina and style, and six erect awl-shaped stamina; the two which are opposite, are of the

the length of the encephalium, the other four are longer, terminated by erect acute-pointed summits; it hath a taper germen, supporting a short thick style, crowned by an entire headed stigma. The germen afterwards becomes a long taper pod, depressed on the sides, opening in two cells, which are filled with roundish seeds.

There are three species of the turnep, viz. the garden turnep, with a white root; the turnep with an oblong root, or the female turnep; and the turnep with a spindle-shaped white root, commonly called French turnep.

Of the turnep there are many varieties, such as the red round, the green top, the yellow, the black-rooted, and the early Dutch turnep. The turnep is a species of the brassica in the Linnean system.

All sorts of land, when made fine, either by dung and tillage, or by tillage alone, will produce turneps, but not equally good. The best land for turneps is a rich sandy loam. The best time for sowing the seeds of field turneps is from the middle of June to the middle of August. However, in some parts of the country it may be advisable to begin to sow earlier, and in some parts, and in some seasons, it will do to sow them latter.

I sowed a field with turneps in September 1793, and it produced a very good crop; the land was dunged the former winter, and sown in the spring with oats, and as soon as the crop was harvested I had the land plowed and the seeds immediately sown, which

which came up vigorously. But had the land not been in good heart, or had the latter end of the year proved unmild, the turneps would have produced little or nothing but tops.

If a crop of wheat can be harvested in the month of August, the land plowed, and sown with turnep seed, there will be a probability of obtaining a good crop, which may be fed off with sheep in time for sowing barley the succeeding year.

Oat, barley, or wheat stubble is generally chosen for the bringing on crops of turneps. The first preparation for the crop is to plow the land in the months of November or December, or before the frosts set in. The advantage of this plowing not only meliorates the land, but is the means of turning out pernicious insects and their eggs to the severity of the winter. The next plowing should be cross-ways in the month of March, and the rougher the land is laid at this time, so much the better.

If the land is not in good heart, it should be manured; and if this material work has been left undone till just before the last plowing, it should be gone about judiciously; for if the manure is suffered to lie any considerable time on the surface of the land, much of its goodness will be evaporated. To proceed, therefore, regularly and economically, begin either in the middle or at one side of the field, and lay the heaps of dung or manure in lines from top to bottom, and let it be spread, and plowed in immediately.

With regard to the seed, it is recommended by able agriculturists to sow the great round turnep that
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lies almost quite above ground. This sort of turnep grows larger than any other, and has the quality of being used in winter with much greater ease than those sorts which root almost entirely under ground, and are consequently not to be so easily got at in time of frost; but, on the other hand, those kinds, whose root or bulb lies nearly under ground, are less liable to be hurt by the frosts than those sorts which swell mostly above ground.

In the sowing of turneps I generally allow rather more than a quart of seed to each acre. Some indeed have recommended only a pint, and others still a less quantity; but I would advise every cultivator of turneps not to be too sparing of his seed, for if the plants happen to come up too thick, it is an easy matter to thin them, but if they come up too thin, it is a great disappointment.

The drill method of cultivating turneps is generally practised by such gentlemen as wish to be considered complete husbandmen; but the broad-cast, or old method, seems to be the most preferable to the generality of farmers. The instruments used in the broad-cast way are plain and simple in their structure, and easy and familiar in their application; but the drill system requires complicated machinery, and, being founded upon principles, demands some degree of reasoning to understand it. The practice of drill husbandry, either in the cultivation of turneps, or any other crop, requires such strength and spirited ingenuity as are not met with in every part of the country.

The

The most common misfortune to turneps is the fly, which eats them off just as they come out of the ground. Many remedies have been proposed for this evil; but the best dependance is on having the land well enriched, and properly prepared. After the turnep has gained one clear rough leaf, the insect seldom does it much injury; therefore when the land is well prepared and sufficiently manured, the growth of the turneps is by that means forced and so much accelerated, that they presently grow out of the power of the fly, especially if a shower of rain happens to fall about the time that the seeds begin to vegetate, which is very shortly after their being deposited in the earth.

When a crop of turneps is by the fly totally destroyed, the land, if it be not too late in the season, should be plowed and sown again; but if it be past the turnep-sowing season, the best way will be to sow the land in the autumn with wheat.

One necessary part of turnep husbandry is to have the plants properly thinned, and the weeds which arise among them entirely destroyed. This is to be effected by means of the hoe, and the time to begin the work is when the plants have made four or five leaves.

If the turneps are of a large sort, they should stand about 16 or 18 inches asunder; but if they are of a middle-sized kind, 10 or 12 inches will be a sufficient distance.

If the crop be a late one, once hoeing will do; but if an early one, two will be required. In the latter

latter case the plants, by the first hoeing, need be thinned to no greater distance than about 6 or 8 inches, leaving the proper thinning for the latter hoeing. At the time of hoeing care should be taken to move all the surface of the land among the plants, whether weeds appear on it or not.

On some grounds, and in certain cases, it may be necessary to leave the plants at a greater distance than what I have mentioned; but that, as well as several other matters, must ever be left to the discretion of the agriculturist.

Immediately after sowing, if the surface of the land be dry, it should be rolled. Some disapprove of this method, but, from repeated experiments, I can recommend it as being beneficial.

If the land among the turneps have become hard, so that the hoers can get on but slowly, it will be advisable to harrow it with light harrows: This method I have found to be an advantageous one. It should be performed a day or two before the turneps are intended to be hoed, in order that those which happen to be injured by the harrowing may be clearly distinguished from those that are not.

ON THE CULTURE OF RED CLOVER.

RED clover is a species of the trefoil, which in botany is called *trifolium*, and is a genus of the *diadelphia decandria* class. Its characters are these:
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The flower has a tubulous permanent empalement of one leaf; it is of the butterfly kind, and is frequently permanent, drying in the empalement; the standard is reflexed, the wings shorter than the standard, and the keel shorter than the wings; it has ten stamina, nine joined and one separate, terminated by single summits, and an almost oval germen, supporting an awl-shaped style, crowned by a single stigma; the germen becomes a short pod with one valve containing roundish seeds.

Clover may be esteemed, from its excellent quality, great produce, and meliorating root, which greatly improves land, one of the best artificial grasses in point of value. And it is now in such general use, that it appears almost needless to describe the method of its culture.

Since the red clover has been cultivated in England, the clay lands, which we are informed before produced little but rye-grass and other coarse grasses, have been greatly improved; for, by being sown with red clover, they have produced more than double the quantity of fodder they used to do, whereby farmers have been enabled to feed a much greater stock of cattle, and the ground has been enriched, and prepared for corn.

Clover seeds are commonly sown with barley and oats in the spring, and when the crops are taken off, the clover spreads, and covers the ground.

Some let clover remain on the ground as a crop for two succeeding years, but it would seem that this

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is not a profitable method ; for clover is a biennial plant, that is, it is only of two years continuance. The seed, being sown in the spring with other crops, does not produce its crop in the same year in which it is sown, but is kept back till the second year by the superiority of the crop with which it is intermixed ; so that by the time it has produced one crop, two seasons have passed over since the seed was deposited.

Clover will remain in the ground for three years, but this is occasioned by its being mown or eaten down, which causes the roots to send forth new shoots.

The best land for clover is that which is the most suitable for wheat, and which is a strong rich loamy soil, which lies on a dry bottom. The best season, in my opinion, for sowing the seed is in a dry time in the month of April.

The proper quantity of seed for an acre of land is about fourteen pounds, but some advise that ten or twelve pounds are sufficient, and others recommend the sowing of twenty pounds on one acre.

The clover seeds, when sown with barley or oats, should be sown after the land is harrowed, otherwise some of the seeds will be buried too deep ; and the land should be afterwards rolled, in order to press the seeds into the ground ; but if the land be not dry at the time of sowing the seeds, they should be harrowed in with short teathed harrows, and the rolling deferred till the surface of the land become dry.

There

There are several farmers who make it a practice to sow their clover seed in the spring among wheat, and either roll it in, or bush-harrow it, and sometimes both.

Clover, like most other vegetables, delights in a rich warm soil, and always thrives best in those lands which have been well dunged or manured. When it is sowed for seed, the custom is to feed it down close until about the latter end of May and no longer, which early feed is of advantage for ewes and lambs, and other cattle, as it comes in before the natural grasses.

The usual way is to mow clover, and make it into hay. The best time to begin to mow it is when the plant is in full blossom: Being cut green, it is excellent food for cows and horses.

As the quality of clover is nourishing, it is excellent food for draft horses, for fattening oxen, and for milk cattle; but it is not much respected for saddle and coach horses. Sometimes it is mowed a second time late in the month of August or beginning of September; but the hay of this second crop is almost always less in quantity, and of an inferior quality to the former; and, therefore, if the cultivator be not in any great want of hay, he will do well to feed it, or plow it up, instead of mowing it a second time.

There is a species of clover called cow-grass, which has been of late years cultivated with great success. The land relishes this sort of clover extremely well; and it is by many farmers preferred to the common

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clover :

clover : It grows more luxuriant, and thrives better, upon poor land than the common red clover. At first sight they are not very easily distinguished, but upon close inspection, the cow-grass is found to be of a darker green, and more pointed at the ends of the leaves ; the stalk is of a closer texture, and not so porous as the common clover. Some people are of opinion that this grass is a native of this country.

OF THE WHITE DUTCH CLOVER.

THIS grass grows naturally in most of the pastures in England, as well as in those of Scotland. It is an abiding plant, and sends out roots from every joint, so that it makes the closest sward of any of the sown grasses, and it is the sweetest food yet known for almost all sorts of cattle. In land designed for continued pasture, a quantity of the seeds of this plant should be sown with other grasses. The seeds of this sort of clover are annually exported from Flanders by the way of Holland, whence it is called Dutch clover.

ON

ON THE CULTURE OF SAINTFOIN.

THIS plant in botany is called *onobrychis*. Its characters are these: The empalement of the flower is permanent, cut into five parts at the top; the flower is of the butterfly kind; the standard is oblong, reflexed, and indented at the top; the wings are oblong and erect; the keel is compressed, broad at the end, and bifid at the base; it has ten angular stamina, nine joined and one separate, and a narrow compressed germen, supporting an oval-shaped style crowned by a single stigma; the germen afterward becomes a compressed roundish pod, which opens with two valves, inclosing one kidney-shaped seed. Linneus has joined this to the genus of *hedysarum*.

The common saintfoin is a plant of great use for the feeding of cattle; it is called saintfoin, or wholesome hay, from its excellent nutritive quality. The stalks are commonly about two feet high, but they grow sometimes much longer; it has tufts of red flowers of three, four, or five inches long, which are succeeded by roundish compressed prickly pods, each containing one kidney-shaped seed; it flowers in June, and the seeds are ripe in September; the roots continue in the ground many years. There are two or three varieties of this, which differ only in the colour of their flowers.

The land most proper for this grass is chalk, sand, gravel, or almost any mixed mould, provided it be not wet; for if water, or too much moisture, be re-

tained about the roots of the plants, it will chill and rot them. April is the proper month to sow the seed in ; the land should be perfectly clean, and free from weeds, and the seeds of them.

To have the land thoroughly cleaned before the sowing of the seed is the chief circumstance required ; for it will grow very well in the poorest land. The quantity of seed requisite for an acre of land is about four bushels in the broad-cast way, but if sown in drills rather less will do. The ground cannot be made too clean before it is sown, so that it generally succeeds best after a crop of turneps ; and it is best to sow it with about half the quantity of barley which is usually sown for a full crop ; for the barley will shade and keep it moist during the first summer, and, at the same time, not injure it, as the crop will be lighter than ordinary.

Some say the proper quantity of seed is from four to five bushels per acre, and that saintfoin flourishes so well by sowing it broad-cast, that there is no inducement to attempt it in the drill method.

It is, I believe, a general opinion among the cultivators of saintfoin, that this plant never succeeds well in any land where there is not an under stratum of stone, chalk, or some other hard matter to stop its running ; but that otherwise it spends itself in root, and comes to little or nothing above ground. This, according to Mr. Tull, is an error ; because it is certain that the roots being to plants what the stomach and intestines are to animals, the more and larger roots any plant has, the more nourishment it receives,

receives, and the better it thrives. The root of this plant is frequently drawn out of the ground to the length of twelve or fourteen feet, and it is said to be often thirty feet or more in length.

The long root of faintfoin has near the surface many horizontal roots issuing from it, which extend themselves every way; there are of the same kind all the way down as the roots go, but they become shorter and shorter all the way. Any dry land may be made to produce this valuable and useful plant, though it be ever so poor; but the richest and best lands will produce the finest crops of it.

Saintfoin thrives best on a thin coat of earth with a chalky bottom, and it is observed in general that it will grow in any soil, except such as is very clayey, damp, and low; and that though the crop is in proportion to the goodness of the land, yet that which grows on poor land is reckoned most sweet and nourishing for cattle.

It is a very useful and valuable grass, and cannot be too highly esteemed. In some parts of Hampshire, Wiltshire, and Berkshire, there are considerable tracts of land sown with faintfoin, which now let from twenty to thirty shillings an acre, which would not be worth half that rent in corn, or in any other mode of husbandry.

The first autumn after the sowing of faintfoin it should not be fed at all, but in every succeeding summer it may be mowed for a crop, and in the autumn it may be fed off with any cattle except sheep; but they should not be suffered to eat it close,

nor have leave to graze on it after the month of October. Every autumn afterwards it may be fed off with sheep, as well as other cattle, and may be fed close down till about Christmas, when the cattle should be removed from it.

The manuring of saintfoin lands, every third or fourth year, with soot, or peat-ashes, is a good method. If saintfoin happen to be sown on its proper soil, it will last eighteen or twenty years; and when the land is broken up again it will be considerably improved by the roots of the plant, with which the ground, in such a length of time, must be full. It does not come to its full perfection till about the third or fourth year after sowing; and about the tenth it will begin to decline, unless assisted with manure.

ON THE CULTURE OF RYE.

IN botany, rye is called *secale*, and is a genus of the triandria digynia class. Its characters are these: There are two flowers in each involucre; they have two leaves, which are opposite, narrow, erect, and sharp-pointed; the petals have two leaves, the outer valve is rigid bellied, acute pointed, and compressed; the lower border is hairy, ending in a long awn; the inner is spear-shaped; they have two oval nectariums, and three hairy-like stamina, hanging without the flower, terminated by oblong forked summits,

summits, with a top-shaped germen supporting two reflexed hairy styles, crowned by a single stigma. The germen afterwards becomes an oblong, almost cylindrical seed, which ripens in the empalement. There is but one distinct species of this genus which is cultivated in England, though it is often supposed the two varieties distinguished by the farmers, under the names of winter and spring rye, are essentially different.

The winter rye is that which is generally propagated, and this sort of grain succeeds very well on any sort of dry land, and even on the most barren gravel or sand. The best time to sow the seed is in the month of September, and the quantity of seed sufficient for an acre of land is about two bushels. It may be sown on land which the preceding summer produced wheat, barley, oats, pease, or tares. When it is sown, in order to produce a crop of ripe grain, the land should be clean, and in pretty good heart.

This grain is frequently sown on land which is designed for fallow the following summer, and which is good husbandry; for as it is the most hardy and early grain which we have, it makes excellent green food for sheep and horses in the months of April and May; after which there is sufficient time to give the land a summer fallowing. Rye is an impoverisher of land; therefore, after a crop of it the ground should be well manured.

The general use of rye, especially in the northern parts of the country, is for bread, either alone, or mixed with wheat. But in the more southern parts

the green plant is often used by the farmer, and is of great service in the month of April for feeding his ewes and lambs.

The harvesting of rye is generally performed in the same manner as that of wheat.

ON THE CULTURE OF RYE GRASS.

RYE-GRASS, or darnel, in the Linnean system is a species of the lolium. This grass is much esteemed because of its hardy quality. It will grow on any land, and therefore produces crops where nothing else will. It equally endures the severest frosts of winter and droughts of summer. It comes earlier than most other grasses, and all cattle are particularly fond of it in the spring of the year; but towards midsummer the stalks become dry, and cattle then refuse them; therefore in all pastures this grass should be kept down by being constantly fed.

This grass is very valuable on several soils; but the cultivator should be careful of not introducing it on improper land. Being sown with clover it is of great use on most light soils; but on heavy wet loams or clays it is by some reckoned as pernicious a weed as a farmer can throw on his land. On sands, sandy loams, gravels, or poor gravelly loams, it is very useful; on such lands it is generally sown with red clover, and in that mode of culture, when mown early, the clover and it being intermixed, make excellent

cellent hay. By proper management of this grass, the cultivator or farmer may in general command good pasture for his sheep early in the spring.

If rye-grass be sown with a crop of corn in March or April, on land clean, and in good heart, it will in general be ready for the sheep by the beginning of the following April. The importance of such food is then very great, and should recommend the culture of this plant to those who occupy poor dry soils. Many parts of England would suffer if the farmers were deprived of it. When rye-grass is sown alone, an acre of land will require at least four bushels of seed; but when it is sown with clover, the quantity should be considerably less.

Two ill properties of rye-grass are, first, it is an impoverisher of land; and secondly, after the first crop is mown off, it grows but little the rest of the year.

OF TREFOIL.

THIS grass is very useful on poor land; for the closer it is fed the more it will spread, and therefore it is highly useful in laying down land for sheep-pastures; but it is not held in much esteem for dairies, or for feeding cows, as it gives the milk a rank taste, and consequently the butter made from such cannot be very good flavoured. Nor is it well calculated for mowing, for it produces but little
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after-grass, and the hay is rather of a critical nature; for if rain fall upon it while making, the leaves are apt to mat together, and by that means it becomes mouldy and ill-flavoured.

Trefoil in botany is called *trifolium*; it is therefore of the same species as the red and white clover. It is generally sown in the spring, among oats or barley, and when sown alone, two bushels of seed to one acre of land is recommended; but when sown with other seeds, such as clover, a less quantity is sufficient.

POTATOES.

I HAVE been informed that the potatoe plant was first introduced into this country from America, about the year 1623, and the culture and use of it have been very general for fifty years past. The Indian name of this plant is *batatas*, from which it is evident the English name is formed. In botany it is called *solanum*.

The potatoe is the most useful root we have; it will grow and come to perfection in any part of Great Britain.

In the northern, cold parts of the country, it is particularly useful, because it can be harvested in good order in seasons when crops of grain are damaged, and fail, through the inclemency and coldness of the weather. It may be dug up and housed in

in one and the same day ; and if kept from the frost, in a clean dry place, it will keep good, and be fit for use seven or eight months of the year. It will grow in almost any sort of soil, provided the land be dunged and well prepared ; but the best land will produce the most abundant crops. The soil which, in my opinion, is the most preferable for the cultivation of the potatoe plant is a deep land, which is neither too stiff and untractable, nor too light and crumbling ; neither too poor nor too rich, yet inclining to richness ; neither too flat nor too hilly, but rather gently rising ; neither quite dry, nor yet burdened with moisture. With a soil of this sort, and proper management, an excellent crop may be expected.

There are many different ways of preparing the ground for a crop of potatoes. The most common methods are either by plowing, trenching, or digging. When the ground intended for a crop of potatoes is not very extensive, I can, from experience, say that trenching, or deep digging, are by far the most preferable methods.

Potatoes delight in fresh sweet land ; and a good coat of dung, not over-rotten, should be dug into it, the sets planted about two feet, or thirty inches, row from row, and about sixteen inches plant from plant in the rows. In very rich ground they may be planted a little thinner, and in poor soils rather thicker.

Those who plant a large quantity should have at least one dibble for that purpose. It should be about three and a half feet long, and a cross handle at the top

top to take hold of with both hands, and the lower end should be shod with iron, about nine or ten inches up, having a branch of iron fixed at about five inches from the lower end, to set your foot upon to thrust it into the ground, if it chance to be hard.

The seed potatoes should be changed once in every two or three years, and they should be perfectly sound and good; if the potatoes are small, they may be planted whole, but if of a middling size or large, they should be cut into two, three, or four parts, taking care to leave at least two eyes * to every set; they should be buried in the ground from three to five inches deep.

From the middle of March to the middle of April is the best season to plant potatoes in.

As soon as the potatoe plants begin to appear through the ground, it should all be clean hoed and loosened, whether weeds appear on it or not, and when the plants are about half a foot high, the loose mould should be drawn up in a small ridge to the stems of the plants, which is in general all the hoeing that is required; for if the land be in good heart, the branches of the plants will in a short time overshadow the ground, which is a preventative against weeds.

* Some writers recommend that only one eye should be left to each set; those who find by experience that method to be the best, should undoubtedly follow it; but I have found none that could produce any satisfactory reason, why only one eye should be left to each set.

Land

Land intended to be planted by means of the plow, should be plowed deeply once or twice in the autumn, and as many times in the spring following, and well dunged with dung just only as rotten as it can be well plowed in, without hanging or sticking about the plow.

The most expeditious method of planting potatoes, is for two plows to follow each other*, and men, women, or boys, to drop the sets in behind them: By this method, the rows will be from twenty to twenty-four inches from each other. After the planting is finished, short-teethed light harrows should be drawn over the ground to smooth it.

The horse-hoe husbandry has by some been much recommended for the culture of potatoes; and there have been instances of great crops being obtained in this way. The principle of introducing the horse-hoe, is to save some of the expense of hand-hoeing, and also to make the crop more flourishing. The advocates for this mode of husbandry confess that there are more plants in the old method; but they affirm that the tillage of the plow is so much more effectual than that of the hand-hoe, and the admission of air among the plants so much freer, that the loss of the number is more than made up in the gain of the size. It has indeed been said, that the horse-hoeing is so effectual that there is no occasion for dung with it: However, let all cultivators be exceedingly sus-

* When this method is practised, the horses should not walk in the furrows.

picious

picious of such assertions; for if they give up the benefit of manures for imaginary theory, they will, undoubtedly, in the end repent it. There is little doubt but potatoes may, in certain soils, be cultivated to advantage without dung, but not equally profitably: On most lands dung is absolutely requisite; for potatoes are impoverishers of the ground, and it is through dunging and tillage, and not by means of any enriching quality in the nature of a potatoe crop, that a good crop of wheat may be obtained after one of potatoes.

There is a disease incident in potatoes called the curl, which is very injurious to them: When they are much infected thereby, their produce is greatly diminished in value.

The Society for the Encouragement of Arts, Manufactures, and Commerce, has some time ago laudably offered a reward to the person who shall discover the nature and cause of this disease, and point out an effectual method of cure; but as no person has yet discovered an effectual remedy, I shall here transcribe the Society's praise-worthy proposal, in order that it may be made as public as possible.

“To the person who shall discover to the Society the nature and cause of the disease in the potatoe plant called the curled potatoe, and point out an effectual cure, the whole verified by repeated and satisfactory experiment, the gold medal or thirty pounds.”

In my opinion the person who finds out and discovers the secret of curing the said disease in potatoes deserves

deserves more than three times the value of the premium offered by the Society. At some future period, if I live, I intend to make public my sentiments on this, as well as on several other diseases to which different plants are subject.

OF BUCK-WHEAT.

IN botany buck-wheat is called *fogapryum*; in the Linnean system it is a species of *polygonum*. It is a native of England, and will grow well on the poorest driest soils. The best season for sowing the seed of it is in the month of May: Two and sometimes three bushels are sown on an acre: If tares are sown among it, it makes very good green feed for horses. Its seeds are excellent food for hogs and poultry. It is a very useful plant in dry seasons, because when common grass in pasture lands is burnt up, it remains green and unscorched. The flour of it is very white; and in some countries it is mixed with wheat flour, and eaten.

For manure buck-wheat is the most useful vegetable that I know of to plow into the land when green. When it is intended for this purpose, it should be sown thick, and suffered to grow up till it be just coming into flower, then rolled and plowed in.

Some farmers make use of a chain fixed behind the horses, just before the plow, dragging it along the

the surface of the ground; this lays the crop flat, and thereby the plow is better enabled to bury the green vegetable. Others make use of a double plow, or one plow going behind the other; the foremost turns it in shallow, and the hindermost brings a thin layer of mould from the bottom of the first furrow, and lays it on the surface, which completely covers the green crop, and enables it to putrify and rot, which is of great service to the land. By this method poor hilly barren lands may be greatly improved; for, after every such process, they will be able to produce at least two crops of corn. The seeds of buck-wheat being mixed with oats make very good food for horses.

Buck-wheat is frequently sown with the seeds of wild; to protect the young plants from the droughts in summer.

OF MANURES, EARTHS, &c.

GARDENERS and farmers understand by the term Manure not only the excrements of animals which the litter, but every thing that will ferment with the earth, such as the rotted stalks and leaves of plants, and of trees of all kinds, the emptying of ponds and ditches, chalk, lime, marl, and many other things.

The uses of manures are sufficiently proved; they are used to repair the decays of exhausted and worn

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but land, and to cure the several defects in different natural bad soils, the faults of which are as different as the nature of the different manures used to improve them; some being too cold, moist, and heavy; and others too light and dry.

To apply dungs and manure in such a manner as most effectually to promote vegetation, it is of consequence to know their natures, and the ways in which they operate; this is the more necessary, as without it we cannot know how to apply them in the most proper manner to the different soils.

Dungs and manures work in all the different ways by which vegetation is promoted; they operate by communicating the vegetable food which they contain to the soil with which they are mixed.

From supposing that manures operate only in one way, mistakes have arisen, and none perhaps have been attended with greater loss than supposing that they serve only to divide the soil, and that tillage may be substituted in their place: This was Mr. Tull's opinion, and is the fundamental principle of his horse hoeing husbandry; but before a person sets aside the ordinary practice of agriculture in so great a point as that of banishing manures from his fields, the good effects of which are so evident, he should be certain that the principle which induces him to so important a change is itself well grounded.

Mr. Tull has endeavoured to prove that earth is the food of plants, and therefore infers that to divide the earth into small particles by which it is fitted for entering their roots is all that is required in agri-

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culture,

culture, and this he says may be done by plowing and fallowing; but it is evidently clear that other principles besides earth are in the composition of the food of plants, therefore the want of manures which help to furnish these other principles cannot be supplied by tillage.

It is certain that every particle of earth which we observe is not of the kind that constitutes the food of plants; but undoubtedly dung contains a large quantity of that which really is the food of plants, for it has already been food to them; and therefore, though all that is contained in the greatest quantity of dung laid on at one time is but small in proportion to the quantity of soil employed in vegetation, yet it may be considerable in proportion to the quantity that is really the food of plants.

If the quantity of earth contained in the quantity of dung commonly laid on the land at one time be compared with the quantity of earth contained in the richest crop, it will probably be found several times larger; and therefore, by the laying on this dung, food is provided for several succeeding crops.

The action of the plow cannot be supposed to increase the number of the particles which are the nourishment of plants: The plow does nothing more than open the soil, which allows them to extend their roots in search of their food, but does not in any degree increase the quantity of it; and therefore tillage cannot supply the place of dung, which not only opens the soil by its fermentation, but also increases the vegetable food by the earth which it contains.

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It is found that manures enrich the best pulverized soil, and this they do again and again, after it is exhausted by crops: It is a common practice to lay dung upon land that is kept constantly in tillage once in three, four, or five years; and it is observed that after the dung is laid on, the land becomes rich, and that the crops turn gradually worse and worse till the whole virtues of the dung are exhausted; and it is also observed that immediately upon the dung being applied, the land becomes rich as before: Hence it is natural to conclude that dung promotes vegetation by increasing the quantity of the vegetable food.

Some manures lose great part of their virtues by being long exposed to the air. The longer dung lies after it becomes sufficiently rotten, the less valuable will it be; for it will not enrich so large a quantity of land as if used in proper time. The dung of cows or horses being dried upon their pasture, gathered and laid upon other land, is little discernible in its effects on the crops produced: The same quantity applied without being dried has a more powerful effect. Hence it is obvious that this kind of manure contains the vegetable food in itself, and does not receive it from the air.

It is observed, that the longer some manures are exposed to the air, they operate the sooner, and with the greater violence: Lime and marls are of this kind, and it is observed that they have a strong power of attracting the virtues of the atmosphere. Hence it is reasonable to conclude that these manures operate, by communicating to the soil with which they are

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mixed,

mixed, a power of attracting the vegetable food from the air. It is found that some manures exhaust land of its vegetable food, and do not restore it again when immediately applied: This is found to be the case with lime; for land thoroughly limed has been known to bear many good crops, but, by degrees, the virtues of it have been exhausted, and the land reduced to a worse situation than before the lime was laid on. In this situation the lime has been applied a second time, but its effects found to be far inferior to what they were after the first application. This is a convincing proof that this manure operates by dissolving the vegetable food which it meets with in the soil, and fitting it for entering the roots of the plants.

Manures are by some divided into classes, natural and artificial; others divide them into the fossil, the vegetable, and the animal; and treat of them in order, as belonging to each of these classes. The manures, belonging to some of these classes, differ both in their nature and operation from those in other classes; some of them likewise from others in the same class; But the dividing of them into classes seems to be of little importance. To treat of the different particulars which the farmer can command, is all that is necessary. The food of animals, reduced to a corrupted state, constitutes dung; the stomach dissolves that food, and reduces it to a state of putrefaction much sooner than is done by the air: It is by being in this state of putrefaction that the juices, fit for the nourishment of the body, are conveyed by the lac-

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teals into the blood. While bodies are in a sound state their parts adhere firmly together, and they are incapable of being turned into the parts of other bodies. To render them capable of this, they must be reduced to their first principles: This is done by corruption. It is known that by corruption all the parts of bodies are relaxed, and the salts and other juices which they contain, from being fixed, are made volatile. It is by being reduced to this state in the stomach that the things which the animal feeds upon become nourishment to it, and are turned into parts of its body.

The whole of the juices contained in the things which animals feed upon are not exhausted by passing through the intestines; for many of them, along with the earthy part of the food, are thrown out. However, there is no doubt that some of the earthy part of the food goes also to the nourishment of the animal; but as the earth is rendered volatile or light, by the salts and oils, there must be but a small quantity of it in proportion to the quantity of these exhausted by the animal, and therefore in the dung there must be a great quantity of earth in proportion to the other principles; but as the dung contains all the principles of the food, it may be considered as vegetables in a putrefied state.

The dung of animals that feed on animals is of the same nature with the dung of animals that feed on vegetables; for all animals either feed on vegetables, or on animals which have been fed with vegetables; so that all animals are made up of the same things, with vegetables, only under a different

form: On this account the dung of all animals may be considered as vegetables in a putrefied state, although the dung of some animals may be more rich than the dung of others, occasioned by the nature of the animal which it passes through.

We are informed by chemists that dung is compounded of the same principles of which vegetables are compounded, that is, of water, air, oils, salts, and earth, and the earth which dung contains is of the mellow drying kind, and attracts the other principles. The chemists also inform us that dung attracts and ferments with acids, and by this fermentation produces salts. And a quality of salt is to attract and dissolve oils, and make them capable of being mixed with water.

If the qualities of dung are considered, it will evidently appear that it is a strong promoter of vegetation. It encourages vegetation, by increasing the vegetable food, for it is compounded of the same principles of which the vegetable food is compounded. Dung promotes vegetation, by enlarging the pasture of plants; it attracts acids from the air and soil, and by raising a fermentation with them, thereby separates the particles of the soil with which it is mixed; this is confirmed by the experience of all places and all ages; and I think it is what no person will doubt of, who duly considers that it has the same effects upon land of all kinds, and in all situations. Every farmer knows the truth of this from experience: The land upon which dung is laid, though naturally stiff, becomes soft and mellow, and is more easily plowed than before.

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We are informed by chemists, that the neutral salt found in soil is compounded of an alkaline salt, such as is found in vegetables, and an acid spirit. Alkalies are strong attractors of acids *, so that, in the process of an experiment upon soil, it may perhaps be difficult to keep them separate, although they may exist separate in it. Acid plants prevent alkalies and acids from mixing, or, perhaps, have a stronger power in their vessels to separate them than other plants have.

* Acids derive their name from the word *acere*, to be sharp, which expresses one quality by which they are distinguished, that is, their four taste. They form one of the general classes into which simple salts are divided, and are the most simple of all saline substances. If they were separated from water, to which they have a strong affinity, and from all other substances not necessary to their saline essence, they would appear under a concrete or solid form; but the contact of the air, which is loaded with watery vapours, is sufficient to dissolve them, and, therefore, they are always in a fluid state: On this account chemists say, that it is not easy to ascertain the quantity of acids in acid liquors.

Alkalies are substances which, being mixed with an acid, occasion an ebullition and effervescence. In effect alkalies are not of one similar homogeneous nature; but there are several sorts of them. The first are obtained from animal and vegetable substances by distillation, burning, putrefaction, &c. Such are spirits of hartshorn, salt of tartar, &c. The second are of the terrestrial or earthy kind, as shells, chalk, &c. Philosophers say that acids, from their universality, are of the greatest use in the economy of the world: The earth, air, and water, abound with them. It is observed, that the air is most replete with acid when the wind blows from the north and east, and when the weather is serene. Sir Isaac Newton accounts for the effects of acids by the great principle of attraction.

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But though soil may contain no acids, excepting in the compound of neutral salts, yet there can be no doubt of their being contained in the air. Chemists have found this by trying experiments. When acids are exposed to the air, they produce neutral salt. The application of acids has the same effect. A salt is observed adhering to the lime of old walls. This salt is not in the lime, but is produced by the air. The same salt is produced by acids. Dung promotes vegetation by communicating to the soil a power of attracting the vegetable food from the air; it also promotes vegetation by preparing the vegetable food for the nourishment of plants.

Although vegetation be promoted by dung in all these ways mentioned, yet, as there are other bodies that are much stronger attractors of acids, by which many of its effects are produced, it is probable that it principally operates by increasing the food of plants. The salts which dung contains and produces, having its own oils to work upon, and being along with them conveyed into the roots of plants, cannot operate with any violence upon the oils which the soil contains; therefore, when the virtues of dung are exhausted, the soil is no poorer than before it was laid on.

Although, in general, dung has all the qualities mentioned, yet some kinds of it are possessed of some of these qualities in a greater degree than others. There may be said to be as many kinds of dung as there are of animals, and they differ in some respects from one another. The difference betwixt

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one kind of dung and another is supposed to arise from the different food of animals, as well as from the different natures or qualities of animals. Straw, hay, and green herbage, do not contain so much vegetable food in the same quantity as grain does; the dung of sheep and fowls is more rich than the dung of cows and horses. Some animals digest their food more quickly than others; this makes a difference in the dung produced by the same food. Some things are digested, and turned into a state of corruption by some animals, that pass through others sound and undissolved. The matter then in the stomach, that digests the food, must be different in the different animals; The dung must partake something of the nature of this, which makes another difference in the dung produced by the same food.

There are some writers who have treated of the dung of different animals separately, but to do this seems needless; for it requires more pains and expense to keep them separate, and use each of them by itself, than all the advantages arising from this way above the ordinary one can amount to. The dung of poultry and pigeons is an exception to this; for it is used in general without mixture, and it can be kept separate from other dung without any trouble or expense. The effects of it are more violent and sooner over than the effects of common dung; the effects of some other kinds of dung would, perhaps, be the same if they were kept in the dry, that is, under cover, and used without any mixture.

Pigeons'

Pigeons' dung, being thoroughly corrupted, soon dissolves, and becomes vegetable food; but straw, with which the other kinds of dung are commonly mixed, not being so thoroughly corrupted, prevents the effects of them from being so violent, and so soon over. The strewing chaff of any sort from time to time on the bottom of a pigeon-house is a good method; because it sucks up the moisture, and helps to reduce the dung to powder, which is an advantage; for, by that means, the dung is scattered more easily and equally, and, therefore, manures a greater quantity of land.

The manuring of land properly is so necessary a branch of agriculture, that no object is more essential in the practice of husbandry than that of procuring a suitable and sufficient quantity of this useful improvement. It is found that the richest land will not produce a long succession of crops without manure, at the same time that the poorest soil will make a considerable return when pains are taken to assist it: Therefore, to improve agriculture, care should be taken to raise as much animal and vegetable manure as possible, and to contrive to multiply it by adding such other component parts as industry can find in different situations.

What tends much to the increase of animal and vegetable manure is a judicious choice in the system of cropping. It has been said, and I am inclined to believe it, that any limited portion of land, tolerably good in nature, will produce, if well cultivated, and properly

properly stocked, vegetable and animal manure enough to support itself in good heart for ages without any foreign aid.

Horse-dung is reckoned best for cold lands, and cow-dung for hot ones; but being mixed together, they make very good manure for most sorts of soil. Sheep's dung and deers' dung differ very little in their quality; they are by some esteemed the best of all dungs for cold clays: For this purpose some recommend the beating them to powder, and spreading them thin over the autumn or spring crops. Human dung is a good improver of all cold and sour lands; but before it is used, it must be thoroughly mixed with earth. For all stubborn clayey soils the cleaning of the streets of large cities and towns is excellent manure.

I have known some gentlemen cut up the surface or sward of their land, and dry it, and burn it to ashes, and then scatter the ashes of the sward thus burnt on the surface of the land. This, I suppose, they did for the purpose either of cleansing or manuring their ground; but whatever end they aimed at, I shall not hesitate to pronounce the method a very bad one. In burning, the sward or surface is pared off to at least the thickness of two inches, and, as it is of a hollow porous substance, it may be justly reckoned, that if the earth were well shaken out, and separated from the roots of the grass, these two inches by such means would not be reduced to less than one inch and a half; but when this two inch turf is burnt to ashes, they will not cover the surface of the ground

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to the thickness of half an inch, so that, upon any soil, this diminution must, undoubtedly, impoverish the land.

Marls are earths composed of different proportions of argillaceous * and calcareous † earths: From the latter they derive the property of effervescing with acids, and they are fusible by fire, as all mixtures of these two earths are.

The marls in the northern parts of England contain sand, and run into a sort of loam: Those in Sussex are more like fuller's earth, and, therefore, are much the fattest and richest.

Marl, in general, has something of the nature of chalk, and the potters find that when either chalk or marl happen to be mixed with their clay, they will burn with the rest of the substance, and the vessels will seem very sound; but as soon as any water is put in them, they will run, the chalk or marl having been burnt into a sort of lime, and flaking like common lime with the water.

There are several sorts of marl of different colours and qualities, as the white, the black, the blue, and the red. Their hardness is as various as their colours; sometimes they are soft and ductile like clay, at other times they are found hard and solid like stone, and sometimes they are extended into thin beds like slate.

Such as bricks and earthen wares are made of. Something that partakes of the nature and qualities of quick lime.

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The goodness of marls, says Mr. Miller, may be better judged of by their purity and uncompoundedness, than by their colour. Thus, if the marl will break to pieces like dice, or into thin flakes, or is smooth, like lead ore, and without mixture of gravel or sand; if it will shake like slate-stones, and shatter after wet, or turn to dust when it has been exposed to the sun, or not stick together when thoroughly dry, like tough clay, but is fat and tender, and will open, and not bind the land on which it is laid, it will be beneficial to it.

Some try the goodness of marl by putting some of it into a glass of water, and reckon it good if it dissolves as soon as it comes to the bottom, and feels soft between the fingers; but the surest sign of its goodness is if it dissolves by wet or frost.

Marl is supposed by some to be fruitful from its salt and oily quality; the salt it is supposed to contract from the air, and therefore many are of opinion that the longer it is exposed to the air, before it is used, the better. They lay it upon the grass-land in some places two or three years before they plow it up; and when they cover the arable lands with marl, they plow it in very shallow. Others are of a different opinion, and would have it buried deep, that the sun may not draw out its virtue.

The marls are in themselves so different, that both these opinions seem right in part; the marls of Sussex being found to succeed best when buried deep as soon as taken from the pit; and those of the North

of

of England seldom doing much good to the lands unless they are exposed a long time first.

Dr. Ainsley is of opinion that marl contains no salts; nor does he think that it attracts salts by being exposed to the air.

Dr. Hunter says, "Marl, though a rich manure, has no salts. It is thought to contain a small portion of oleaginous* matter, and an absorbent earth, of a nature similar to lime-stone, with a large quantity of clay intermixed."

Dr. Ainsley says "Marl consists of two parts, possessed of very opposite qualities; the one clay, or a mixture of clay and sand; the other a substance soluble in acids, convertible by calcination into quick lime, and, consequently, a real calcareous earth, differing in no respect from the calcareous earth of lime-stone, and the shells of animals."

Some ascribe the fertilizing quality of marl to its calcareous earth, which is known to be a powerful fertilizer of land, or it may introduce a certain degree of tenacity or stiffness into too light and sandy soils, by which means the water, which is the principal pabulum, or sustenance of plants, is prevented from escaping too fast by evaporation. The experience of the farmers in different places has shown also that different times are to be observed for the laying it on, according to its nature, and that of the land to be improved by it. In Sussex they always

* Oily.

lay

lay on the marl in the beginning of winter; and in Staffordshire, in May and June.

Marl is in general allowed to be, when properly applied, a very lasting improvement. Mr. Young mentions instances of its continuance for forty and fifty years; and of one species even for an hundred years.

“It is a very material circumstance in the marling of land, to find out how much the land requires of this manure; and till experience has thoroughly shown this, it is better to err in laying on too little than too much *.” It is to be observed, that marl never makes so great an improvement on land the first year as it does afterwards.

Chalk, if it be of an oily, soft quality, easy to dissolve, is a tolerably good manure for most land; but it is of most use upon stiff clayey land, for it loosens and meliorates it, and by that means renders it fruitful.

Unctuous, or mellow chalk, is a fine improvement for land, especially the first time it is laid on. It changes the very nature of the soil, and makes it rich for a time, but it soon exhausts it, and requires

* When good marl can be procured, we need not be scrupulously nice in its application; for, as far as I can learn, it never disappoints the expectation of the agriculturist.

Chalk should be laid on in the months of October or November. If it is laid on the land in the spring, or summer, it should be immediately plowed in; for if it were exposed for a time to the scorching rays of the sun, it would become so hardened that the frosts could take but little or no effect on it afterwards. Chalk used for manures, which do not moulder by being exposed to rains and frosts, should be turned into lime.

dunging

gunging to keep it in heart afterwards. A second chalking will prove of very little benefit to those lands which succeeded ever so well with the first, unless they have lain a long time to recover themselves after it. The best method, therefore, of using chalk is to mix it with dung, or mud; this will make it not only a temporary, but a lasting advantage to the ground. The common method of chalking lands is to lay ten or twelve loads of chalk upon every acre, and this will sometimes make the land bring rich crops. On some lands, in the county of Surrey, farmers lay from forty to fifty loads of chalk, and sometimes more, on one acre, by which the soil is much improved. It is best to carry the chalk upon a ley a year or two before it is plowed up; by this means it will sweeten the surface of the earth, and will not work so much downwards as it would if plowed in at first. It makes corn yield well, and when laid upon grass-ground, it makes the grass sweet and rich; and cattle that feed upon such grass grow fat soon. Cows also that feed on pastures manured with chalk are observed to give better milk than ordinary.

Chalk is found in large strata, chiefly in the south-east part of Britain; so that if a strait line was drawn on a map from Dorchester to the coast of Norfolk, it would nearly include the chalky strata of this island, for no considerable quantity is dug beyond that line.

Chalk raises an effervescence with acid liquors, and is therefore deservedly looked upon as an alkaline or absorbent earth.

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When chalk is thoroughly reduced into a powder by the winter frost, it is of great service to some strong clayey lands, not on account of its rich fertile quality, but because it sweetens, loosens, and meliorates the land, and makes it more fit to receive and incorporate with manures of a richer nature that may be thrown upon, or plowed into it. Chalk loosens stiff land, and thereby the rains are permitted to pass freely through its pores; this is of great benefit in winter, and in cold springs.

It is best, seldom to attempt the raising particular crops upon land where the soil is naturally ill calculated for their production. It is a very nice part of the agriculturist's business to find out and understand what sorts of corn, grass, or plants, are most suitable and fit to the ground that is to be sown or planted; and for want of due attention to this principal subject, bad success and failure are frequently the consequence. There are rich loams, and mixed soils of various complexions, which are favourable and kind to the growth of most branches of the vegetable kingdom. The value of such will easily be found out by the crops they produce; but there are many soils whose nature must be studied before any great advantage can be derived from them; and, as they are frequently blended together, and in colour and appearance much alike, it is rather difficult to describe them sufficiently.

Mr. Bradley reduces all soils to three heads, or kinds, viz. sand, loam, and clay. Gravels, and all open soils, till we come at loam, are of the sandy

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rate; and the binding earths, from loam down to the stiffness of chalk, may be ranged under the clay kind. Loam, or mother-earth, is the medium between the two, and includes all the intermediate kinds. All these soils tend alike to vegetation, and each has its peculiar plants, which will not grow so well in the other.

The temper of soils is best found out by their natural produce, by the grasses and weeds which are always to be found on the borders and skirts of the fields, which characterise them truly. This makes it essentially necessary that every man should study the nature of all natural grasses, wild plants, and weeds, before he can presume to be a general judge of the quality and value of land. However, some soils are so distinct in their nature as to be easily described. Blue clays, and cohesive loams, are by nature evidently designed for grass; and if well laid down, and properly managed, are generally found to be good pastures. Red and black clays, if they be not too tenacious, or of a tough, sticking nature, are in general well calculated for wheat, oats, and beans. Sands of all kinds, and light soils of every degree, are best calculated for barley, turneps, and several sorts of artificial grasses.

The land of England, as considered by the farmer, is reduced into nine sorts of soils; The sandy, the gravelly, the chalky, the stoney, the rocky, the hazely, the black earth, the marsh, and the clay land.

Of this last kind there are four varieties, distinguished by their colours; The black, the blue, the

the yellow, and the red. In many places these soils are mixed and blended together, and where it is so, it is much better than where they are separate, especially where the mixtures happen to be of a right kind; as those of the hot and dry soils blended with the cold and the moist. This is often found done by nature, and it may be imitated by art. All sands are hot, and all clays are cold; and therefore the laying clay upon sandy lands, or sand upon clayey lands, is a good method for their improvement. Mixed loamy soils that have a good bottom, or understrata, are the best of all others for corn. It is not only the nature of the soil which we ought to consider, but the depth of it, and what soil is underneath; for good soil of ten or twelve inches deep, which lies upon a cold clay, will not be so fruitful to the farmer as leaner soils that lie upon better understrata. Gravel, sand, chalk, and limestone, are good understrata.

Cold and wet clays are much more fruitful in the southern parts of England than in the north; the climates therefore are to be considered as well as the qualities, or proportions, of the different kinds in the mixed soils.

All land that moulders into dust by frost and rain, with all sorts of warm lands, black mould, yellow clays, if not too wet, are in general good lands for corn. Land that produces large trees, and such as produces black thorn, rank grass, and lies in bottoms, open to the east, or south, being well sheltered from north and north-west winds, may be esteemed

to bid fair for good land. Chamomile is an indication of land being disposed to bear good crops of corn. Land that binds after frost and rain, or that is very moist and cold, or that is too hot and dry, and that lies open to the north on the sides of hills, exposed to cold winds, and all that naturally bears holly, ivy, juniper, fern, or brakes, furzes, broom, and heath; and lands that bear mosses, rushes, and wild tansey, with flags, and other such plants, which betoken a cold and damp ground, are less fit for corn, though other things may succeed on them.

One great article in the culture of all plants, is the soil. In many cases it is not sufficient to have found a soil, which, once tried, proves beneficial, and to suppose that it will always continue so. In course of time, the soil which was once fit for the nourishment of some peculiar vegetable loses its virtue, and this sooner in some lands, and later in others. All who are conversant in husbandry are well acquainted with this; they therefore never crop their land two years running with one sort of grain.

It may be observed, that all lands naturally endeavour to produce one crop annually: And in agriculture, I am of opinion, that by proper strength, good management, and a judicious rotation of cropping, almost all land would produce at least one crop every year, without diminishing its value: Some will be ready to say that such a method would entirely set aside fallowing, but that would not be the case; for a crop of rye, fares, &c. may be sown in the autumn, and fed, or moved off for green food, the following

lowing spring, or beginning of summer, and afterwards the land fallowed, manured, and cropp'd with wheat.

The more that people plant, sow, and produce, for the mutual benefit of man and beast, the nearer they come to the best system of husbandry.

I apprehend, the main point in agriculture or husbandry is to keep the land clean, and in good heart; and to get as much produce from it as possible. These things are to be done and obtained by weeding, hoeing, fallowing, manuring, and by a judicious interweaving the crops, which are particularly useful to man; Such as wheat, barley, rye, oats, potatoes, pease, and beans; with the crops most useful to beasts, such as turneps, carrots, tares, or vetches, artificial grasses, &c.

The husbandry of the Austrian Netherlands is very useful, and the Norfolk system comes nearly to the practice of that country. One of their best courses is divided into six divisions, which are as follows:

First, wheat; second, barley; third, turneps; fourth, barley with clover, or other artificial grasses; fifth, clover, or artificial grasses of the first year's ley, generally mowed; sixth, the same of the second year's ley, generally grazed.

To support this course of cropping, they always manure for wheat and turneps; by this means, they sustain a great deal of stock, and keep their ground in good heart, and very clean; but they find an in-

convenience in their clovers coming round in too quick a succession, by which means the land grows weary of it.

Such a system as this might be improved upon by a closer imitation of the Flemish husbandry, by dividing the land into eight divisions, cropped nearly in the following order: First year wheat, after clover, of one year's ley; second, turneps; third, barley; fourth, pease, beans, potatoes, or tares; fifth, wheat; sixth, turneps; seventh, barley, with clover seed; eighth, clover.

The ground, by this method, will almost regularly produce an alternate crop for man and beast; and the land will never dislike the clover, because it will only stand one year out of eight, instead of two out of six. Every other crop will likewise be meliorating, and the ground kept clean. But neither this, nor any systematical farming, will answer on every sort of land; for, notwithstanding all the directions that ever have, or can be given, much must be left to the skill and judgment of the agriculturist. For even, supposing all lands to be alike in their nature, in every respect; yet the industrious farmer in many operations must be directed by the seasons, not only in regard to the time of sowing, but even in the kinds of crops intended to be sown.

There is land of a hazely reddish colour, which is by some farmers called a brickish soil; it is frequent in Essex and some other counties, and approaches to the nature of loam. It has no stones in it, and does

not bind after wet as clay does, but lets all the water in that comes; whereas clays hold the water till the sun exhales it.

These loams are an excellent mixture for other earths; being a medium between two extremes, uniting what is too loose, cooling what is too hot, and entertaining a moderate share of moisture.

The best produce of brick earth is rye; if well dunged it will bear wheat, barley, oats, turneps, beans, pease, and clover. Some say the best manure for this land is chalk, mixed with coal-ashes. Marl makes a great improvement; and there is a yellow stiff kind of clay that moulders with the frost, which answers the same purpose. Whatever amendment is bestowed upon this sort of land, that does not absolutely alter the nature of the earth, lasts but a little while. Such land binds very much after rain, and it yields but poor crops in wet years. The weeds are generally very rank, and the wheat runs all into straw. Fallowing is a great improvement of it, for it generally produces good crops the year after.

We are taught by experience, that the longer we keep off the succession of any crop, the better it will be. Land delights in a variety of seeds, and dislikes a too frequent repetition of the same grain. Clover in particular may be sown on the same land till the ground be so thoroughly tired of it as almost to reject it entirely; this has prompted many farmers to attempt the growth of several species of grain and grasses, wholly incompatible with their soil, thereby running at once into the opposite extreme.

judgment will introduce as much consistent variety as possible, and equally avoid the folly of running into extremes.

If the soil be cold, stiff, and suitable only to wheat, beans, and oats, it will be running a risk to aim at separating these crops with turneps and barley. A better way will be to interweave some meliorating crops, such as tares and buck-wheat, which are excellent changes for this sort of land; on the other hand, upon a very light sandy soil, wholly calculated for rye, barley, turneps, and artificial grasses, it would be equally unsafe to lay much stress upon wheat, beans, and oats. In such ground, potatoes, tares, and carrots, will be the means to keep the land cool, and prove valuable crops in moist seasons.

On loamy lands the advantage of both sorts of grain may be united; and as almost all the articles before enumerated may be sown upon it, there will be no difficulty in varying the different sorts of grain, which is indisputably a mean of keeping the land in good heart. Some have recommended the plowing green crops into the land. Dr. Fordyce says, "The remedy for land exhausted by lime, &c. is to plow it as deep as possible, so as to bring up a body of new mould before winter; then fallow it well the ensuing summer and autumn, that every part of it may be exposed to the winter and summer air; dung it strongly; then sow a crop of those plants that yield most mucilaginous matter*, and, before their

* Plants that yield most mucilaginous matter are pease, beans, tares, turneps, rape, &c.

leaves

leaves have done flourishing, plow in the crop: If this be done exactly as here described, the land will acquire a new stock of nourishment, and come into good heart again." Some say lime enriches the land it is laid upon by means of supplying a salt-fit for the nourishment of plants; but by all the experiments that have been made upon lime, it is found to contain no kind of salt: Its operations should, therefore, be considered in a different light. By the fermentation that it induces, the earth is opened and divided, and, by its absorbent and alkaline quality, it unites the oily and watry parts of the soil: It also seems to have the property of collecting the acid of the air, which it readily forms into a neutral salt of great use in vegetation. From viewing lime in this light, it is probable that it tends to rob the soil of its oily particles, and in time will render it barren, unless care be taken to support it with rotten dung, or other manures of an oily nature.

The method of converting earths and stones into lime is very simple. It consists in the exposing them to the action of fire in kilns made for this purpose, till they become of a white red heat, and in keeping them in this degree of heat for the space of fourteen or sixteen hours. Good lime may also be made with a less heat continued for a longer time, or in less time with a more intense heat; but care should be taken that the heat be not so violent as to vitrify* the calcareous stone.

* Vitrify means the turning of things into something of the nature of glass.

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The effects of calcination or burning, and the principal properties that distinguish lime from uncalcined calcareous earths, are the following: The earths and stones from which lime is produced contain a large quantity of air in a fixed state, called fixed air; and by some writers calcareous gas, which in calcination is expelled, and, therefore, in this process they are rendered more friable, and their weight is very considerably diminished.

We learn from the experiments of Hales, Black, Jacquin, and others, that if calcareous stones are calcined in an apparatus of close vessels, so that whatever is expelled by fire may be retained, they may be converted into lime without the concurrence of the external air; that, during this calcination or burning, a certain quantity of aqueous liquor is expelled from calcareous stones, though they have been previously well dried; and, moreover, that a considerable quantity of a volatile vapour is disengaged during the calcination, and this vapour is the same as the gas, or fixed air, which is expelled by adding acids to calcareous earths, and which occasions the effervescence that arises upon mixing these substances.

From this discovery of the existence of gas in calcareous earths, and of the total privation of this fluid in lime, we obtain a clear and satisfactory explication of the various properties of lime, and also of other similar substances.

The best lime is that made of the hardest, firmest, and whitest stones, and which is slaked at its coming out of the furnace. It may be determined whether
a stone

a stone will burn or calcine by letting a few drops of aqua fortis, or any strong acid, fall on the stone, which will boil, and dissolve a part of it, if the stone is calcinable, but will lie upon the stone like oil, and not ferment, if it be not calcinable.

There are two kinds of lime in common use in England, the one made of hard stone, and the other of a soft calcareous or chalky stone; but the former is by much the strongest. That made of soft stone or chalk is fittest for plaistering of ceilings and walls within doors, and that made of hard stones for building and for plaistering without doors.

Lime makes the greatest improvements upon light sandy lands*, or upon dry gravel, but a cold clay is seldom so much benefited by it. If it be mixed with dung, or with mud drawn from the bottom of rivers, it makes an excellent mixture, especially where the soil is very sandy. In Westmoreland they procure fine crops of barley from their sandy lands by manuring them with cow-dung and lime mixed together.

The nature of lime on land is like that of chalk; it works downwards, as the farmers express it: It is, therefore, best to treat it in the same manner, laying it upon a ley the year before it be plowed up.

* A farmer in Scotland, with whom I lived eighteen months, showed me a field in ley, one part of which was beautifully covered with white clover, but on the other part there was scarcely a plant of this sort to be seen. He told me that that part which was filled with the white clover had a few years before been manured with lime, which occasioned the growth of this clover: He never sowed any sort of natural grasses. White clover is a native of Scotland.

Lime

Lime is reckoned to make corn grow with a thin husk ; but it is not a lasting manure, seldom holding for more than five crops. When lime is used to land which lies upon a descent, it should be mixed with dung, and laid rather thickest upon the higher part of the land, the consequence of which will be, that the rain will wash out the virtue of the lime and dung together, and carry it to the lower parts as it runs down. Dung and lime mixed together will do better for any land than either of them alone.

All lime is very good manure, but that made of stone is much better than what is made of chalk. The common allowance is a bushel to a pole square, or a hundred and sixty bushels to an acre. This by some is covered with earth, and let lie till the rains fall, and flake it, and after that they spread it as evenly as possible upon the ground ; they always find that if it be carried hot out of the kilns, and laid upon the land to cool, it does much better than in any other way. The improvement it makes upon land is owing chiefly to its heat ; it is in much the same manner that coal-ashes and the foot of coal become useful on the like sort of land ; but the farmers always find that a mixture of good earth, and lime that has lain a considerable time, is better for this purpose than fresh lime alone.

Manures have been supposed to act either by adding nourishment to the soil, by preparing the nourishment which it already contains for the digestion of the plants, by enlarging the vegetable pasture of the soil, or by attracting the food of plants in greater
plenty

plenty from the air. Under the second of these heads are placed those manures which, as they are not supposed themselves to afford nutriment, are suspected of exhausting the soil by too hastily reducing the putrescible matter into mucilage; and thus, though greater crops be at first produced, leaving the land in a poorer state than it was in before the reception of the aid afforded by these transient helps.

Lime is, in general, classed among these forcing manures, perhaps, with some degree of injustice. It is likely that lime may afford food to plants by the salts it may form in concurrence with the acids with which it may meet: Its effects will, undoubtedly, be more or less durable in proportion to the nature of the land on which it is laid.

Lime is a calcareous earth deprived of its fixed air and water, but which has acquired, in its calcination, a considerable proportion of fire, as is apparent from the great heat attending the slaking of lime with water.

Lime is not classed by the modern chemists amongst the salts, though it has some properties in common with them. It may act as a manure by combining with, and dividing, the particles of clay, and thus forming a species of marl by uniting with the oily substances contained in the soil, and rendering them soluble in water, and by absorbing the dews and rains, and preventing them from sinking too speedily into the earth, by which the food of plants is washed from their roots.

Lime, and the fixed alkalies, are more powerful agents than neutral salts in preparing the food of vegetables, by their operation on the oils and mucilages which exist in the soil, and which have been supplied by manures, or derived from the atmosphere.

As light sandy soils contain but a small portion of fat oily particles, care should be taken not to overdo them with lime, unless at the same time they be liberally assisted with rotten dung, and other manures of an animal kind. Its excellence, however, upon a sandy soil is by binding the loose particles, and thereby preventing the moist parts of the manure from escaping out of the reach of the fibres of the plants. The effect of lime upon clay is different; for, by means of the gentle fermentation that it produces, the unsubdued soil is opened and divided, the manures laid on readily come into contact with every part of it, and the fibres of the plants have full liberty to spread themselves.

Clay, well limed, will fall in water, and ferment with acids: Its very nature is in some measure changed. Under such circumstances the dews, air, and rains, are more freely admitted, and the soil is enabled to retain the nourishment that each of them brings. In consequence of a fermentation raised in the soil, the fixed air is set at liberty, which is the means of promoting vegetation. It is the nature of lime to attract oils, and dissolve vegetable bodies: Hence arise the good effects of lime in the improvement of black mporish land. Moor earth seems to consist of dissolved

dissolved and half-dissolved vegetable substances, and it is said that lime assimilates the one, and dissolves the other.

Daily experience teaches us that all plants, as well as all other living things, must submit to death. They spring up, they grow, they flourish, they ripen their fruit, they wither, and, at last, having finished their course, they die, and return to the dust again, from whence they first took their rise. Thus all black mould, which every-where covers the earth, for the greater part, is perhaps owing to dead vegetables: For all roots descend into the ground by their branches, and after a plant has lost its stem, the root remains; but this too rots at last, and changes into mould. By this means this kind of earth is mixed with the ground and sand by the contrivance of nature, nearly in the same way as dung laid upon the fields is wrought into the earth by the industry of the husbandman. The earth thus offers again to plants from its bosom what it has received from them; for when seeds are committed to the earth, they draw to themselves, accommodate to their nature, and turn into plants, the more subtle parts of this mould by the co-operation of the sun, air, clouds, rains, and winds. So that the tallest tree is, properly speaking, nothing but mould wonderfully composed with air and water, modified by a virtue communicated to a small seed by the Creator. From these plants, when they die, just the same kind of mould is formed as gave birth to them originally; but in such a manner that it is in greater quantity than

than before? Vegetables, therefore, increase the black mould; whence fertility remains continually uninterrupted: Whereas the earth could not make good its annual consumption, unless it were constantly recruited by new supplies.

The crustaceous liver-worts seem to be the first foundation of vegetation, and therefore are plants of the utmost consequence in the economy of nature, though so despised by us. When rocks first emerge out of the sea, they are so polished by the force of the waves, that scarce any herb can find a fixed habitation, as may be observed every where near the sea; but the very minute crustaceous liver-worts begin soon to cover these dry rocks, although they have no other nourishment but that small quantity of mould and imperceptible particles which the rain and air bring thither. These liver-worts, dying at last, turn into a very fine earth; on this earth, the flaky liver-worts find a bed to strike their roots in; these also die after a time, and turn to mould; and then the various kinds of mosses find a proper place and nourishment. Lastly, these dying in their turn, and rotting, afford such a plenty of new-formed mould, that herbs and shrubs easily root and live upon it. That trees, when they are dry, or are cut down, may not remain useless to the world, and lie, as it were, melancholy spectacles, nature flatters on their destruction in a singular way. First, the liver-worts begin to strike, afterwards the moisture is drawn out of them, whence putrefaction follows; then the mushroom kinds find a fit place for nourishment on them,

them, and corrupt them still more. The beetle, &c. next make their way between the bark and the wood, and bore numbers of holes through the trunk. Lastly, the wood-peckers come, and while they are searching for insects, wear away the tree, already corrupted, till the whole passes into earth. Some trees immersed in water, would scarcely ever be destroyed, were it not for the worm that eats ships, which performs this work, as the sailor knows by woful experience.

Suppose there were a heap of clay on which for many years no plant has sprung up, let the seeds of the thistle blow there and grow; the thistles by their leaves attract the moisture out of the air, send it into the clay by means of their roots, will thrive themselves, and afford a shade. Let now other plants come hither, and they will soon cover the ground.

Sea weed is used as a manure; there are different kinds of it. It is said, the best is that which is cut from the rocks, and of which kelp is made. The second best is called the peasy sort. The worst is that with a long stalk. All these kinds are used in Scotland, but chiefly for the barley crop, in which case, or for fallow, it is plowed in directly. It is said, that the people in some parts of the country have so high an opinion of its fertilizing nature, that they sometimes lay it on after the barley is sown; but that would rather seem to be an injudicious method. In the neighbourhood of Berwick it is used in their compound dung-hills with yard-dung, stable-dung, and earth, and in that manner large quantities

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of manure are produced by such farmers as are situated near the sea. It is said, the farmers are very intelligent in that neighbourhood, and it is remarked, that such farmers as use the sea-weed properly, have their land in such heart as seldom to have occasion for a fallow to restore their freshness. This species of manure is experimentally found to be excellent for gardens, as it not only enriches the ground, but is said to destroy all kinds of vermin.

Although fossils are the hardest of bodies, yet they are found subject to the laws of destruction as well as other created substances; for they are dissolved in various ways by the elements, exerting their force upon them, as by water, air, and the solar rays; as also by the rapidity of rivers, the violence of cataracts and eddies, which continually beat upon, and at last reduce to powder the hardest rocks.

The agitations of the sea and lakes, and the vehemence of the waves, excited by turbulent winds, pulverize stones, as evidently appears by their roundness along the shore. The hardest stone insensibly gives way to the soft drops that frequent on it by day.

In the process of vegetable putrefaction, if we throw together any of the tender green and succulent parts of recent vegetables, whether acid or alkaline, in a large heap in the open air, and press them down with an additional weight, if their own be inconsiderable, the middle part of the heap will in a little time spontaneously conceive a small degree of heat, and pass successively through the other degrees,

groes, till it arrive at a state of ebullition or agitation, and be perfectly putrefied.

In the space of about three days from the first putting them together, they will yield a heat perhaps stronger than the human body; by the fourth or fifth day the heat will be too great for the hand to bear without pain; and lastly, by the sixth, seventh, or eighth day, the juices will generally appear ready to boil, and sometimes the matter will even burn and flame away. By this spontaneous operation the vegetable acquires a detestable, putrid, stercoraceous, or cadaverous taste and odour, and turns entirely into one soft similar pulpy mass or crassamentum, greatly resembling fetid human excrements in the scent, and putrefied flesh in the taste.

If now this fetid matter, thus obtained, be directly, whilst it remains in this fetid state, committed to a glass retort, and distilled with proper degrees of fire, there will come over, first, a water impregnated with an urinous spirit, perfectly like that obtainable from animal subjects, and separable by a fresh distillation, slowly made in a tall glass into elementary water, and a large quantity of pure, white, dry, volatile, alkaline salt, not to be distinguished from animal salts. Second, a volatile, alkaline, oily salt, that shoots into globes: Third, an exceeding volatile and thick fetid oil, both which are entirely like those of animals; And lastly, the remainder being calcined in an open fire, affords not the least particle of fixed salt, just as if the subject had really been of the animal, and not of the vegetable kingdom.

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The process is truly universal, and holds equally in all kinds of vegetables, though ever so different in their nature and virtue. Experiments have been made in the coldest and most succulent or watery plants, such as purslain, sorrel, &c. as well as with the hottest or most acrimonious, such as the spurge, &c. and it was always found to succeed; but that the sooner, as the vegetable employed contained the greater quantity of oil, though with the same phenomena.

It will likewise succeed with dry vegetables, provided they be moistened with water before they are thrown into heaps; and thus we sometimes see that stacks of hay will spontaneously take fire and burn away, especially if the hay was not well dried in making.

It is surprising to consider that by this means the difference betwixt vegetables may be entirely taken away, and the whole kingdom thereof reduced to the same common nature; So that wormwood and tansy for instance, or sorrel and scurvy grass, shall appear as one and the same thing, and this thing appear no otherwise than like putrefied flesh.

Though sorrel be famed for its power of preserving the animal fluids uncorrupted whilst they are circulating in the body, and scordium for its embalming virtue, as continuing then in a state of incorruption after death, yet even these plants are themselves thus easily corrupted and changed into such a kind of putrefied flesh as it is their virtue to revert.

This,

This, Boerhaave considers as a general law of nature, wisely established to produce wonderful changes in the world, and to prevent the inaction and decrease in our globe; this active principle or medium giving an easy and reciprocal transition of vegetable into animal substances, and of animal into vegetable substances.

Mucilage is a substance which is converted into the nourishment of all plants; it is formed from the putrefaction of animal or vegetable substances; it is formed also from dew or rain water putrefied.

Mucilaginous juices are of two kinds; one, when dissolved in water, forms a jelly, and is an immediate manure; most animal substances are of this kind. The other kind, dissolved in water, makes a gummy liquid, as sugar does; this kind must putrefy before it comes to a manure: Most vegetable substances are of this kind. The succulent plants, such as pease, beans, turneps, &c. yield much matter to the ground for mucilage. Insects being destroyed and dying in the ground, yield matter for mucilage.

Putrefaction has two stages: The first converts animal or vegetable substances into a mucilage; the second converts that mucilage into one or more species of salt.

Lime, or any other calcareous earth, applied to land, acts in this manner; they hasten the putrefaction of all putrescible substances in a soil; consequently if there be not added, at least, a proportional quantity of dung well mixed, containing mucilage, they infallibly exhaust land; for they convert all the

putrescible matter therein to mucilage much sooner than it would be otherwise converted. This will, at first, make the land produce greater crops than usual, there being so much more additional food prepared for the plants; but after a few years those heavy crops will have consumed most part, if not all, the mucilage, and the little that may remain is converted into salts by the second stage of putrefaction as above mentioned; which salts, in a little time, are rendered of little or no effect, or, if they have any effects, they are hurtful to vegetation if without mucilage: And by this means the soil becomes exhausted.

Mucilage dissolved in water, and applied to plants, makes them grow luxuriant. In a moist soil it jellies the water, and prevents it from soaking through the sides of the roots of plants; in a dry soil it prevents the water from being exhaled; it gives tenacity or stiffness to a sandy soil, and friability to a clayey soil: It is converted into the juices of plants, and nourishes them.

The quantity of mucilage to do real good to a soil must bear a proportion to the quantity of water. Hence may be observed the necessity and good effects of draining land; for though there be a sufficient quantity of mucilage in the soil, yet if the water or moisture exceed its due proportion, all the mucilage is lost, and of no effect, by the mucilage not having the power to give the necessary degree of tenacity and consistence to the water.

Manures are of two kinds; one adds nourishment to the

the soil, as all animal and vegetable substances from whence mucilage can be obtained; the other gives no nourishment to the soil, but forces it by preparing the nourishment already there.

Forcing manures are of two kinds; one resists putrefaction, the other forwards it. That which resists it are several sorts of salt in the ashes of burnt vegetables, in soot, dung of fowls, and some in horse-dung, if it be not too putrid, and in sea-water, &c. Lime is a resister of putrefaction. The way in which these act is to kill the weak fibres of plants, and thereby force them to shoot out stronger ones; they also facilitate the digestion of plants, they dissolve in water, and prevent it from evaporating too easily; they destroy some sorts of insects.

The other sort of forcing manures which forward putrefaction are certain salts formed from calcareous earth, and spirit of sea salt, or oil of vitriol.

Salts are not converted into the nourishment of plants as mucilage is; the richer the soil the more effects it will have. As to all acid and metallic salts, and salt of the earth of allum, they are poisonous to plants.

The fermentations in a dung-hill are allowed to be five: The first makes the juices sweet; the second makes them spirituous like wine; the third sour like vinegar; the fourth and fifth are of the putrefactive kind. During the three first the dung-hill heats, but when the fourth, or mucilaginous putrefaction, begins, the mucilage forms and the dung-

hill grows cold *. After this the last fermentation begins, in which the mucilage is converted into salt.

Care should be taken to mix the whole mass of dung well together, that every part of it, as far as possible, be in the same stage of fermentation, lest some should arrive at the last stage before the other parts are become mucilaginous. This may happen when dung and lime are laid in layers on a dung-hill, and not well mixed through the mass.

Common salt is useful as a manure by contributing to fertilize the soil, though, in the early ages of the world, it seems to have been regarded as a mark of extreme barrenness. We read of princes, who, in token of their indignation, sowed grounds with salt to render them fruitless. See Judges, chap. ix.; Dult. chap. xxix. Pliny, speaking of fossile salt, affirms, that every place in which it is found is barren and unfit for vegetation.

Virgil reprobates a salt soil as occasioning the degeneration of fruit trees, and admitting no melioration from plowing.

Salt in latter times, however, is frequently used as a manure with good success. It has been the custom ever since the time of Henry III., at least, for the farmers on the Cornish coast to manure their lands with sea sand, in which sea salt is so copiously mixed, that in many places it is used to be extracted

* That is the best time for the laying dung upon the land, though it is better to lay it on before it be thoroughly rotted, than to let it lie till it be over-rotten.

from

from a lye made of sand. When the sand has been long exposed to the air, it proves less useful and enriching, which some have attributed to its having been deprived of a good part of its salt by the dews and rains.

This practice of manuring lands with sea-sand has, within these few years, been introduced with advantage in other parts of Great Britain. The Cheshire farmers purchase considerable quantities of refuse of salt from the salt-boilers; they mix it with dung, and, by that means, it makes a good manure. At Northwich alone there were sold a few years ago about three hundred tons of it in one year for the use of the farmers in that and other countries.

In Cheshire and other counties they make great use of the water of their salt-springs as a manure for their lands. They let out the water of these springs for a certain time upon the lands after there has been rain, and by this means the quantity of salt they contain is so blended with the rain water, that it is too weak to hurt the corn or grass, and yet strong enough to kill worms and other vermin, and to improve vegetation.

On the other hand, when the soil abounds with rushes and weeds, it is customary in Cheshire to lay a quantity of rock-salt upon it, as it is found utterly to destroy every vegetable.

From these observations it would seem, that salt, when used in small quantities, is a good manure, and when in large ones, a real poison to vegetables.

Some of the Arabian and African deserts are
thought

thought to be barren by their having too much salt in them, whilst many parts of Barbary are reckoned to be peculiarly fruitful from their containing a less quantity of it. As salt, in small quantities, is known to accelerate the putrefaction of animal substances, and, when in larger, to retard it, and thus is useful in assisting the organs of digestion in man, and other carnivorous animals, salt, applied in like manner as a manure, may be found very beneficial, not from its entering as an aliment into the substance of vegetables, (since there are many experiments tending to prove that no kind of salt can of itself become the food of plants), but from its efficacy in reducing weeds, dried herbage, dead roots, &c. into a putrid oily mass, the fractifying virtue of oily composts being now generally acknowledged; but when it is used in a larger proportion by preserving these matters from corruption, and drying up or hardening the fibrous capillaries of the roots, so that they become unfit for sucking in nutriment, the fertility of the ground is diminished, or wholly destroyed.

As to the fertility of lands overflowed by sea water, it may be partly by the slime and mud left by it, and partly by the salt contained it, which, being in a small quantity, may contribute to the putrefaction of the effete * vegetable roots, and the consequent production.

There are no lands that fatten cattle sooner than those pasture grounds which are thus at times over-

* Effete means lately brought forth.

flowed

flowed by salt water; such are the pastures at Erith near the Thames, which are sometimes overflowed at spring tides †.

Some farmers have tried the scattering salt over their corn fields as soon as sown, in the quantity of two bushels to an acre, with good success; and this quantity may, for any thing I know, be productive of all the advantages which arise from the occasional overflowing of high tides and natural salt-springs.

Much attention should be paid to every thing that relates to manures; without their assistance the richest soils would soon be reduced by frequent cropping to a barren state. It is delightful to observe how the dissolution of one body is necessary for the life and increase of another; all nature is in motion. In consequence of the putrid fermentation that is everywhere carried on, a quantity of vegetable nutriment ascends into the atmosphere, summer showers return much of it again, nay, even what falls into the sea is not altogether lost; for the clouds, from which showers and rains descend, are collected and made up of exhalations and water-sports arising from the sea, together with vapours and exhalations from the land and rivers. “All the rivers run into the sea, yet the sea is not salt; unto the place from whence the rivers come, thither they return again.”

The sea-shores are usually full of dead, testaceous, or shelly animals, wrack, and such-like bodies,

† The water which overflows the meadows at Erith is, doubtless, greatly mixed with the fresh water of the river Thames.

which are yearly thrown out of the sea; they are also covered with sand of various kinds, and other things not very common. It happens too that while the more rapid rivers rush through narrow vallies, they wear away the sides, and thus the friable and loft earth falls in, and its ruins are probably carried to distant and winding shores.

All things contained in the compass of the universe declare, as it were with one accord, the infinite wisdom of the Creator.

Whoever duly turns his attention to things on this our earth, must necessarily confess, that they are so connected, and so chained together, that they all aim at the same end; and to this end a vast number of intermediate ends are subservient.

The terraqueous globe, or world, which we inhabit, is every-where surrounded with elements, and contains in its superficies the three kingdoms of nature; as they are called—the fossil, which constitutes the crust of the earth; the vegetable, which adorns the face of it; and draws the greatest part of its nourishment from the fossil kingdom; and the animal, which is sustained by the vegetable kingdom. Thus these three kingdoms cover, adorn, and diversify, the superficies of the habitable world.

Geography informs us, that the sea surrounds the world, and takes up the greatest part of the earth's superficies. Indeed, it is evident, by shells, strata, and other circumstances, that the sea once overpread the whole world.

Spring;

Springs *, which generally issue out at the foot of mountains, seem to take their rise from the rains and vapours that trickle through the holes and interstices of loose bodies, and are received into caverns.

These afford a pure water, purged by straining, which rarely dries up in summer, or freezes in winter, so that animals never want a wholesome and refreshing liquor.

The chief sources of rivers are fountains and rills, growing by gradual supplies into still larger and larger streams, till at last, after the conflux of a great number of them, they find no stop, but, falling into the sea with lessened rapidity, they there deposit the united stores they have gathered, along with foreign matter and earthy substances which they tore off in the way. Thus the water returns in a circle whence it first drew its origin, that it may act the same scene over again.

Mountains, hills, vallies, and all the inequalities of the earth, though some may think that they take away much from its beauty, are so far from producing such an effect, that on the contrary they give a more pleasing aspect, as well as many advantages. By reason of these the terrestrial superficies are larger, different kinds of plants thrive better, and are more easily watered, and the rain waters run continually into the sea, not to mention many other uses in relation to winds, heat, and cold. High mountains, that reach to the second region of the air, are the

* The origin of springs, or fountains, is a thing much controverted among naturalists.

coldest

solid parts of the earth. Hence the mountains or Alps in Sweden, Switzerland, Siberia, Brazil, Peru, Armenia, Asia, and Africa, are perpetually covered with snow, which becomes almost as hard as ice; But if by chance the summer heats be greater than ordinary, some part of these snows melts, and runs through rivers into the vallies, which by this means are much refreshed.

Winter, by its frost, prepares the earth and mould, which thence are broken into very minute particles, and thus, being put into a mouldering state, become more fit for the nourishment of plants; Snow covers the seeds and roots of plants; and thus, by cold, defends them from the force of cold. The piercing frost of winter purifies the atmosphere and stagnant waters, and makes them more wholesome for animals.

The summers are rendered more pleasing to us through the perpetual succession of heat and cold; and though the winter deprives us of many plants and animals, yet the perpetual summer within the tropics seems not more agreeable, as it often destroys men, and other animals, by its great heat, though it must be confessed, that those regions abound with most delightful and delicious fruits.

Our winters, though very troublesome to a great part of the world, on account of their severe and intense cold, yet are less hurtful to the inhabitants of the northern parts than the great heat is to those of the southern parts. Hence it is that people may live tolerably convenient in almost every part of the earth,

as

as every different country has different advantages from nature.

The seasons, like every thing else, have their vicissitudes or changes, their beginning, their progress, and their end.

The age of man begins from the cradle; pleasing childhood succeeds; then active youth; afterwards manhood, anxious and intent upon self-preservation. Lastly, old age creeps on, debilitates, and at length destroys our infirm and tottering bodies.

The seasons of the year proceed in the same way: Spring, the jovial playful infancy of all living creatures, represents childhood and youth; for then plants spread forth their luxuriant leaves, branches, and flowers; fishes exult, birds sing, and every part of nature seems intent upon generation. The summer, like middle age, exhibits plants and trees everywhere clothed with vigorous green; it gives strength to animals, and plumps them up; fruits then ripen, meadows look cheerful, and every thing is full of life. But on the contrary, autumn is gloomy, for then the leaves of trees begin to fall, plants to wither, insects to grow torpid, and many animals to retire to their winter quarters.

The day proceeds just with such steps as the year; the morning makes every thing alert, and fit for business; the sun darts forth his bright and ruddy rays; the flowers, which had, as it were, slept all night, awake, and expand themselves again; the birds, with their sonorous voices, and various melodious notes, make the woods to ring. Noon tempts animals into
the

the fields, the heat puts them upon indulging themselves in ease, and even necessity at times obliges them to it. The evening follows, and makes every thing more sluggish, plants and flowers shut up, and animals retire to their lurking places.

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THE END.

ERRATA.

- Page 86, line 8, *for* February, *read*, January.
— 144, — 5 from the bottom, *for* part, *read*, parts.
— 327, — 4, *for* substance, *read*, subsistence.
— 388, — 4 from the bottom, *for* left, *read*, taste.
— 448, — 3 from the bottom, *for* clover, *read*, cover.
— 478, — 12, *for* in, *read*, to.



